Customers' machines get final test on Heald run-off floor.

starting point*

for a thousand production lines

* Yes—precision production lines the world over have had their beginning *right here!*

For this is the Heald run-off floor, where *every machine* is put through its paces before shipment—turning out exactly the same parts it will handle on the customer's production line, at the same high production rates and the same close tolerances for size, finish, accuracy and precision.

The practically unlimited variety of work that's handled here is a pretty good measure of Heald versatility. For whatever your precision finishing job, it's neither too large nor too small, too simple or too complex to warrant the full Heald treatment—engineering, manufacturing, run-off testing, installation, training your operators, and friendly, helpful service throughout the life of the machine.

Remember—when it comes to precision finishing, it pays to come to Heald.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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CONTENTS for DECEMBER 25, 1950

VOL. 94, NO. 26

Cover ..... *Operation pictured is described on page 2*

ADMINISTRATION

Editorial ..... *Burnham Finney* 83
Shop FBI ..... *Round Table* 117

SPECIAL REPORT

Machinability Data for High-Temperature Alloys .... *R. Le Grand* 99

ENGINEERING

New System Cuts Airframe Tooling Time 40% 94
Friction Drive Prevents Stripping Fine Threads .... *B. F. Fortin, Sr.* 116
JIC Pneumatic Standards ..... *(RBS)* 125

FINISHING

Steam Sprays Paint ..... *H. E. Linsley* 110

INSPECTION

Expansion Gage Checks Internal Protected Holes .... *D. E. Sweet* 122

HEAT-TREATING

Good Carburizing Practice—5 ..... *T. A. Fischman* 89

MATERIAL CUTTING, FORMING

"Christmas Tree" Slotting Recalls Planer ..... *S. Rudorf* 85
First-Aid for Cutting Die Troubles ..... *Federico Strasser* 96
Tube Coiling . . . Small Coils for Heat Exchangers ..... *Jack Miller* 107
. . . Large Coils for Fireboxes ..... *William C. Keeran* 108
New Buick Crankcase Line Shows Many Improvements *Stan White* 112
Power Spinning Eliminates Annealing, Descaling . . . *L. W. Court* 114
Beveled Drill Tool Cuts Synthetic Rubber 120
Form-Tool Table Compensates for Clearance ..... *R. G. Vare* 121

TOOLING

Drill Jig Locates Casting by Gripping Boss ..... *W. M. Halliday* 118
Stepped Tap Demands Less Power Takeoff ..... *Jay B. Shriner* 118
Cupped Nut Distributes Coolant in Wheel ..... *R. G. Vare* 118
Plate Clamps Hold Work on Tapping-Fixture Base .. *Gerhard Wenke* 119
Split Bushings Chuck Square Stock Securely ..... *Tom Brown* 119
Refitting Tailstock Centers ..... *Charles A. Newkirk* 119
Second-Operation Stop Locates Work ..... *Arthur R. Christensen* 119
Forming-Die Clamp Retracts After Power Stroke .... *Cliff Bossman* 120
Carbide Pads Take Wear from Cams ..... *Charles A. Lauer* 120
Channeled Members Clamp Simplified Die Block *Federico Strasser* 121
Angle Setup on Mill Cuts Internal Ellipse ..... *Francis J. Spollen* 121
Pulley Support Cuts Spring Breakage ..... *L. Kasper* 122

NEWS OF METALWORKING

Spot News 69
Washington 71
Detroit 73
Machine Tools 75
Gaging Metalworking 79
Names in the News 136

DEPARTMENTS

Backlash 64
Tips to Shop Men 113
Reference Book Sheets 125
Talking Shop 131
Equipment Materials Parts .. 138
Free Literature Available 147
Round Table Discussion 160
New Books 176

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Chips and QUIPS

Merry Christmas . . . Because this issue of *American Machinist* is dated Dec. 25, we decided to give you a Christmas card cover. Layouts and ideas were strewn around liberally before we came up with the plan for a Metalworking Santa Claus. But we knew from experience that if we assembled him from available materials, we wouldn't be able to make the photo—too much shine and reflection, too little color distinction. So, to solve our impasse, Asst. Art Director Rooman painted him in casein, to simulate brass, bronze, stainless steel, and steel; with anodized aluminum for the colored spots. In any case, we hope you like him—and will accept our heartiest Christmas wishes.

Christmas Tree . . . Appropriate to this issue also is our lead article, on "Christmas-tree" slotting. It describes machining of the slots (they resemble a Christmas tree) which hold turbine blades to the spindle. Milling and broaching heads on a planer do the job to "tenths" on a production basis. There's a tricky gage-block indexing mechanism too. The author is superintendent of maintenance and tooling at Allis-Chalmers.

High-Temperature Steels . . . Supplementing our earlier Special Report (Nov. 27) on machinability research under the aegis of the Air Forces, Associate Editor Le Grand goes on with an 8-page report on high-temperature steels and their machining, drawing from the Curtiss-Wright report, Ford data, and associated sources. Here is authoritative information on an up-to-the-minute subject.

Steam Painting . . . For over a year, we've been trying to put together a story on a new finishing technique—painting with steam. One maker of electric boilers has shown his units for that purpose in the last two Metal Shows. Three companies have announced special spray guns. But the actual technique, the problems, the advantages and disadvantages, were harder to dig out. Now we have what is currently publishable. It makes an interesting story in this issue.

Pipe Winders . . . Pipe bending and tube bending are tricky jobs, a coil even trickier. But Vapor Heating Corp. has succeeded in developing special winding machines for pressure coils. Herewith Jack Miller tells how the machines work for small coils, Wm. Keeran for large.

Tooling . . . As usual, our pages are knee-deep in the latest on tooling. We give you the details on Buick's crankcase line, something on assembling with fine-pitch screws, Shop Shots in several plants, and several others separately mentioned. There's also our usual selection of new Practical Ideas.

Die Trouble . . . Federico Strasser of Chile is a good shop man south of the equator. Periodically, he has sent us kings. In this issue, we thought enough of his latest piece, that we're making a feature article of it. He lists ten common cutting-die troubles, picks out the causes, and shows cures. Here's a visit for you with a die doctor.

No Stripping . . . B. P. Fortin, Sr., who spent many years with New England shops, tells you what sort of equipment gives uniform, but adjustable, torque for assembly of threaded parts, so stripping will not occur if items have only a few fine-pitch threads.

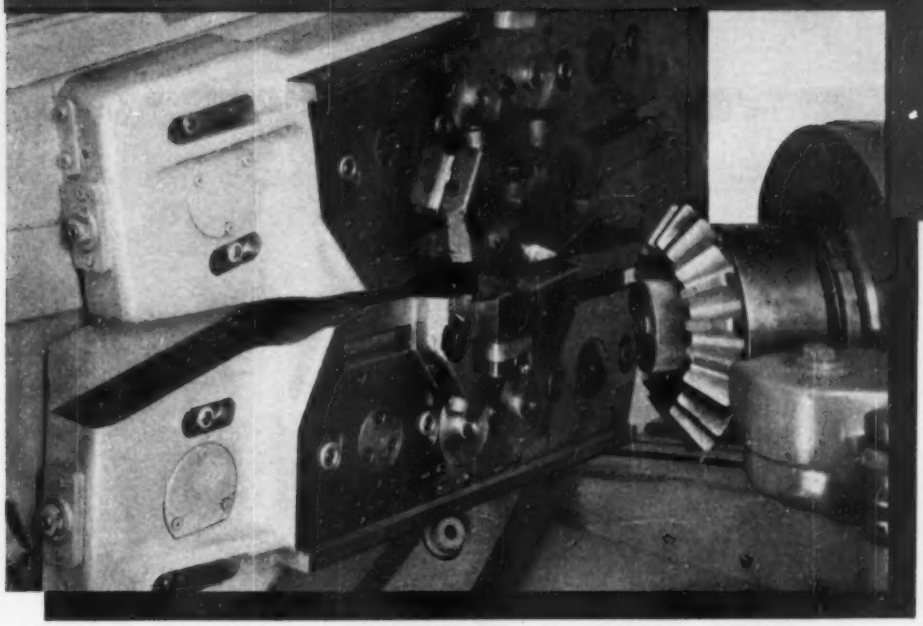
Coming . . . Jan. 8 *AM* will include an unusual Special Report—a roundup of experience from Watervliet Arsenal on how to get straightness and concentricity in long bores. Much of the experience comes from work on the 90-mm gun for the Patton tank. There'll also be stories on tool conservation at Pontiac, on plant lighting, on bandsawing, air drilling, slotting, steels for plastic molds, and apprenticeship, plus our regular departments.

ARTIST . . . Assistant Art Director Richard Rooman usually works with Syd Doherty to do the planning, layout, and rough art work for our articles. For this issue, though, he painted our Metalworking version of the well-known S. Claus right down to the final stroke of the brush.

Dick started working in the magazine field in 1940. He was layout editor for *Factory, Engineering and Mining Journal*, and *Coal Age* until late in 1947; then moved to *American Machinist*. He's been here ever since. Dick worked in the machine-shop and assembly departments of the Avro Engineering Corp. for a year and a half before the war. As a result, he understands blueprints and photos of machine operations.

Now a resident of Levittown, L.I., Dick served three years in the Air Force in the U.S. and the Pacific as a B-29 gunner. He's the proud owner of a Caterpillar Club pin, which he won twice for parachute jumps to save his life.

"CONIFLEX" GEARS HAVE LOCALIZED TOOTH BEARING



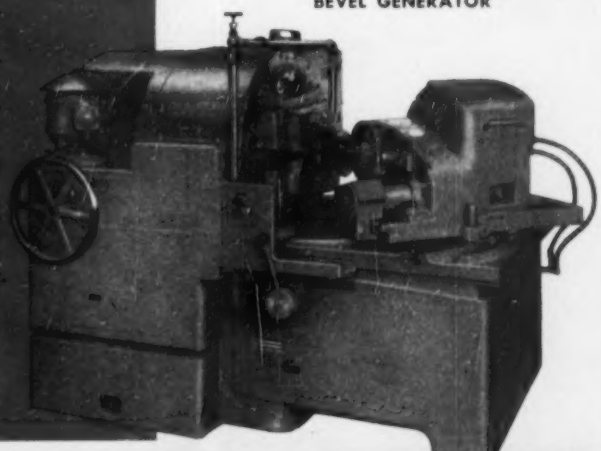
The "built-in" feature of localized tooth bearing on Coniflex gears is easily set through simple dial adjustments only on the face of the tool slides.

GLEASON No. 14 STRAIGHT BEVEL GENERATOR

Coniflex gears are superior to ordinary straight bevels:

- In assembly, for they have wider tolerances for positioning.
- In operation, for they are built to provide even distribution of the load along the tooth surfaces without dangerous concentration at the ends of the teeth.

This "built-in" feature on the gear teeth can be obtained only on Coniflex gears cut on Gleason machines such as the Gleason No. 14 Straight Bevel Generator.



GLEASON Works
1000 University Avenue
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over 85 Years

CINCIN

Aid to High Metal Cutting Efficiency

. . . DIAL TYPE'S EASE OF OPERATION

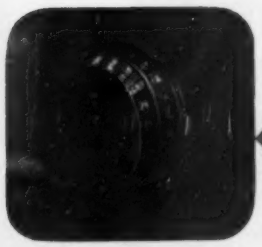
The operator of a knee-and-column type milling machine has more influence on performance than you might think. Take the simple chore of changing speeds and feeds, for example. From start to finish of some jobs, this can (or should) happen several times for each part. Make it easy to do, and the operator will have no objection to doing it. Make it a walking job, difficult or out of reach, and efficient cutting practice usually fares badly. ¶ Recognizing the operator's influence on metal cutting efficiency, Cincinnati has incorporated two big features of easy operation in all their Dial Type Milling Machines.

1. Power selection and changing a wide range of spindle speeds, front and rear operating positions.
2. Power selection and changing a wide range of feeds, front and rear operating positions.

Dial Type Milling Machines have other features of convenient and easy operation: a light touch on the starting lever engages and disengages the clutch; all feed levers are directional; pull-out, quick-adjusting micrometer dials on hand adjustment cranks; plastic knobs on feed control and clamping levers; complete set of controls at rear operating position (plain and universal). ¶ Talk to the man who runs a Dial Type. He'll tell you that Dial Type ease of operation is tops with him. And that makes them tops in optimum production.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI Dial Type Milling Machines have labor-aiding power speed and feed change front and rear. Built in Nos. 2, 3 and 4 sizes; medium and high speed ranges; plain, universal and vertical styles. Write for catalog No. M-1623-2. Sweet's Catalog File gives brief specifications.



Changing Speeds and Feeds at the rear operating position

Changing Speeds and Feeds at the front operating position

CINCINNATI

REPLACE WITH A NEW CINCINNATI

With one hand, and without walking or stretching, the entire range of Dial Type speeds and feeds can be changed with one lever. It's as easy as turning a radio dial.

NATI

MILLING MACHINES • CUTTER SHARPENING MACHINES
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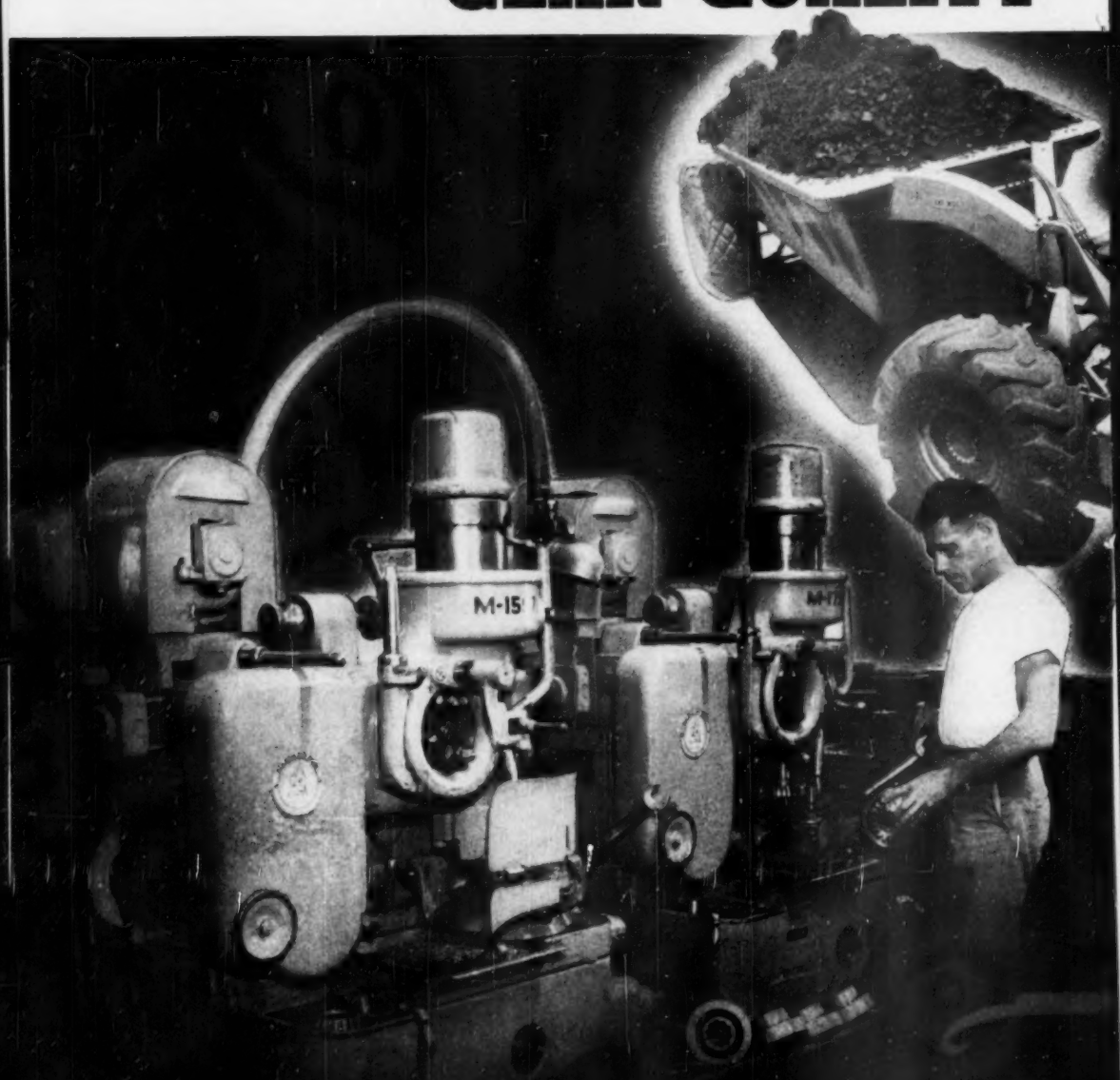
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

GEAR QUALITY



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

HELPS SELL FOR CATERPILLAR

(REG. U. S. PAT. OFF.)

• Precision quality for both engine and transmission gears starts with the generating of spur or helical teeth on Fellows Gear Shapers—as shown on these pages.

A REPUTATION for exceptional stand-up ability is often the extra "plus" that turns a sale in "Caterpillar's" direction. That reputation was planned for as machines were laid out on the drafting board. It is part of the planning of new units such as the DW20 Tractor and W20 Wagon pictured above. It is developed by the setting of quality standards for alloy steels, by the selection and maintenance of shop tools (including the big battery of Gear Shapers), and by rigid inspection before, during and after assembly. Fellows is proud to be able to contribute to the precision quality of critically important parts.

For latest data on the cutting, shaving and inspection of gears for light or heavy duty requirements, call on the nearest Fellows office.

Fellows

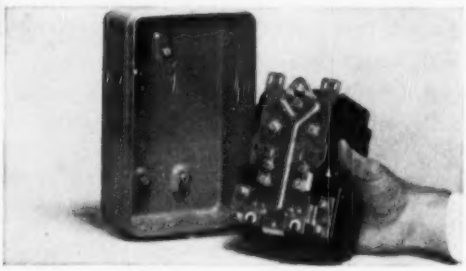
THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department, 78 River Street, Springfield, Vermont, U.S.A.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1.

MOTOR STARTERS ...easier to

T.G. PERITO, ELECTRICAL CONTRACTOR, LEARNS

Mr. Perito: "*Naturally we want to use motor starters on our jobs that stand up—and keep out of trouble. That's one way we keep our customers satisfied. But as electrical contractors, we're equally interested in using starters that are easy to mount and wire.*"

You're not alone, Mr. Perito. A lot of designers and maintenance men want the same thing in a starter—fast, easy installation! That's why we're asking you to make the "screwdriver test" on that new G-E starter in front of you. Ready? Let's go!



1 Mr. Perito: "*How is this contactor mounted in the case?*"
By means of keyhole slots you see in the contactor base, Mr. Perito. After you've mounted the empty case on the wall or a machine, you locate the keyhole slots over the mounting screws and the contactor slips into place!

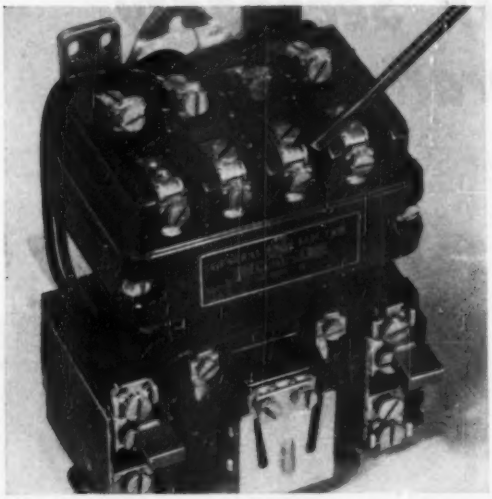
2 Mr. Perito: "*Lots of knockouts, I see!*"
You'll find these on every side of the case—more than enough to give you faster, neater installations. Plenty of room on the inside, too, and notice how the light grey finish on the inside gives you plenty of reflected light!

GENERAL ELECTRIC

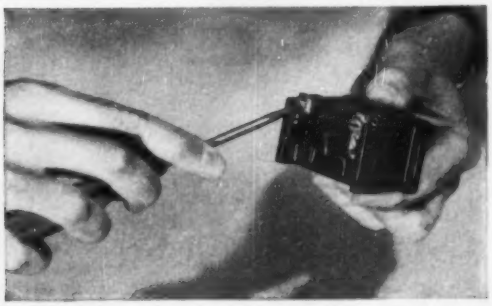
750-18

install for these 6 reasons

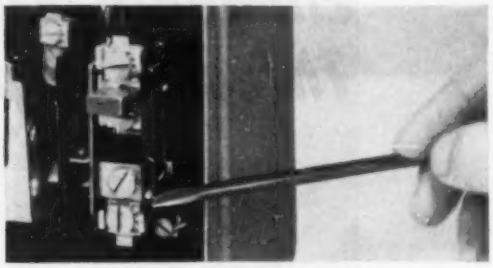
ABOUT THESE IMPORTANT FEATURES WITH THE "SCREWDRIVER TEST"



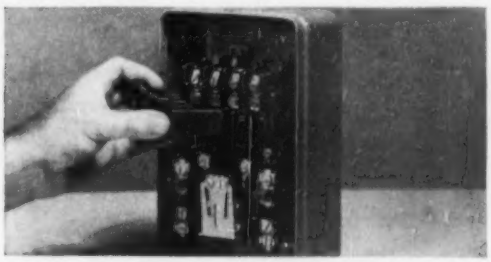
3 Mr. Perito: "*Are all the terminals easy to get at?*" Every one of them is *up front* where it's easy to get at, and wire. And they're *big* terminals with panhead screws and saddle-type connectors that ride up with the screw head. The stripped wire simply slides into place and is easily secured with a turn of your screwdriver.



4 Mr. Perito: "*Tough-looking coil! Is it new?*" Right! It's called the "Strongbox Magnet Coil" and it's an exclusive with the new G-E starter line. Feel how solid it is! If your electrician's screwdriver slips, it can't hurt the windings—they're safely locked in a block of molded plastic. And oil, dust or water can't get at them, either!

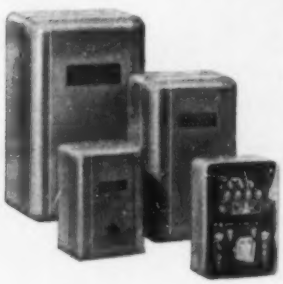


5 Mr. Perito: "*How do I set the overloads?*" Easy—and you don't have to take the starter apart to do it. Flip that little lever and it's on "Automatic." Flip it back and it's on "Manual." Heaters are in the front, can be changed without disturbing any wiring.



6 Mr. Perito: "*What about maintenance?*" Once this new G-E starter is installed, it *stays* installed. There's no need to remove the case for ordinary maintenance or even to replace or reverse contacts. Just remove the arc chute and there are your terminals.

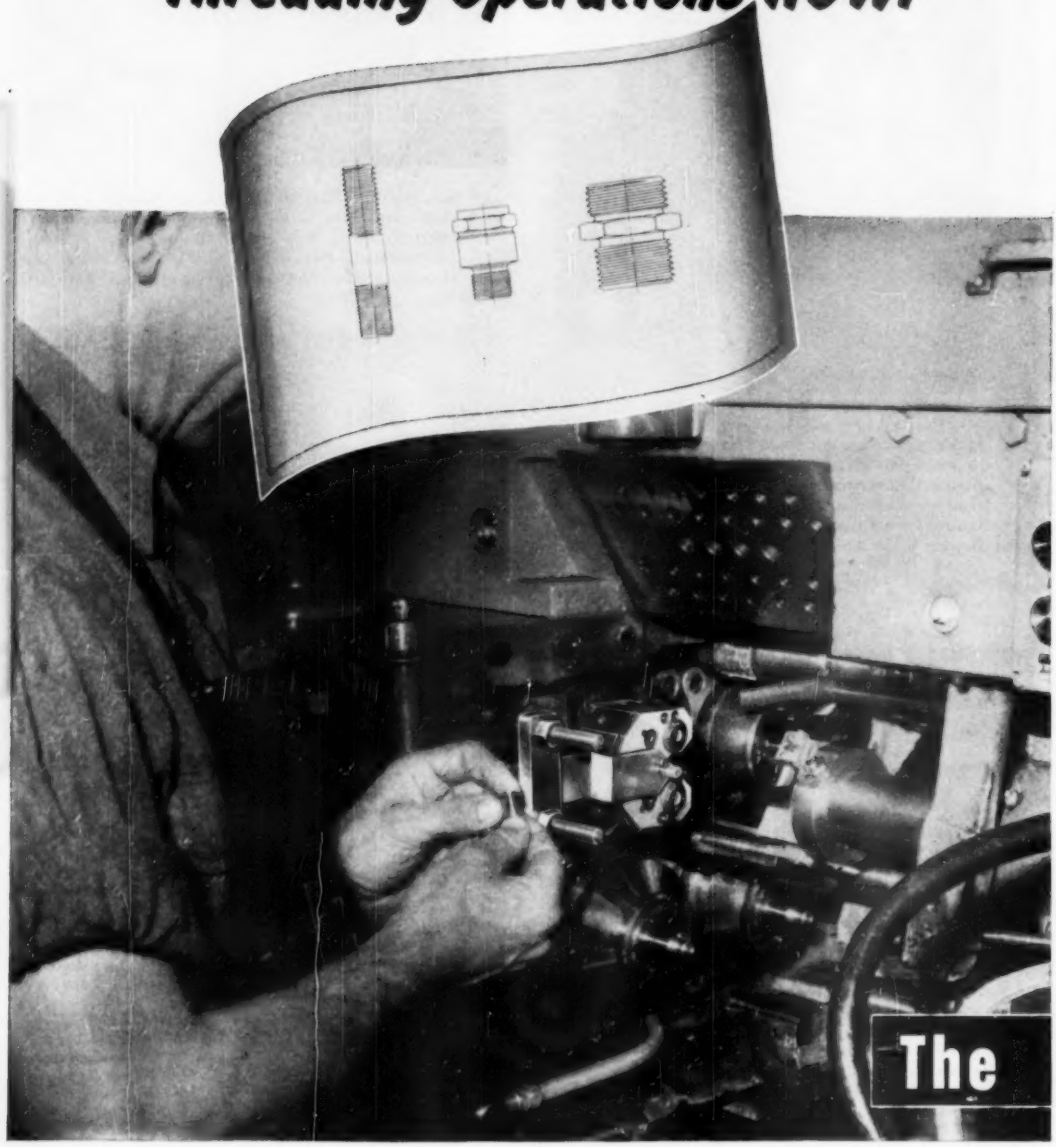
WHY DON'T YOU "BUY ONE AND COMPARE?"



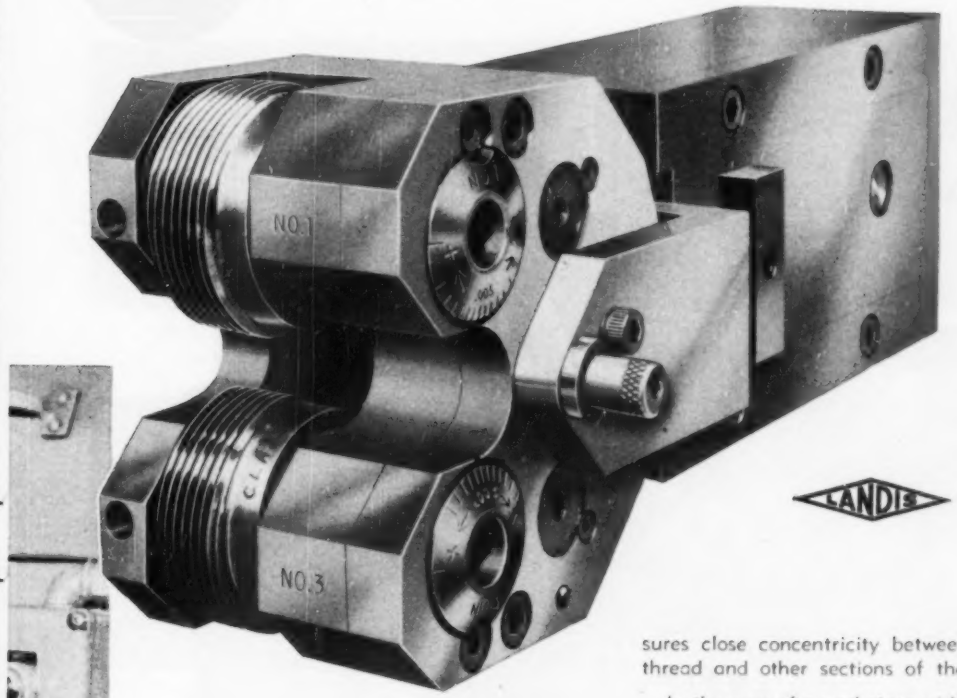
See for yourself why this new line of G-E motor starters lasts longer, costs less to install than almost any other starter you can buy. Your G-E representative or authorized G-E agent or distributor can supply you from stock in NEMA sizes 0, 1, 2 and 3 for a-c motors up to 50 hp. For a complete description, write for Bulletin GEA-5153. *Section 730-18, Apparatus Dept., General Electric Company, Schenectady 5, New York.*

ANNOUNCING—The Model

Eliminate YOUR Secondary Threading Operations NOW!



"G" Lanroll Attachment



Due to product design or shoulder interference, certain sections of a workpiece are frequently inaccessible to die heads which are mounted on automatic screw machines or turret lathes. Costly secondary threading operations are therefore necessary.

Designed to roll straight threads on components which are inaccessible to die heads, the new MODEL G LANROLL ATTACHMENT fits perfectly into the sequence of established machining operations performed by automatic screw machines and turret lathes. By allowing the threading to be completed on the same chucking, this attachment not only eliminates a secondary threading operation, but also assures close concentricity between the rolled thread and other sections of the workpiece.

In the case of a workpiece with a thread at either end, the use of the MODEL G LANROLL ATTACHMENT allows both threads to be generated on the same chucking. The thread farthest from the collet is cut by the usual die methods, while the thread nearest the collet is produced with the attachment. This arrangement also eliminates a secondary threading operation and assures a high degree of concentricity between the two threads.

The MODEL G LANROLL ATTACHMENT guarantees precision thread quality. The use of two diametrically-opposed rolls reduces and equalizes the feed load—thus eliminating tapered and out-of-round threads, extending roll life, and minimizing tool cost.

Write for further information on this cost-saving addition to the LANDIS Line.

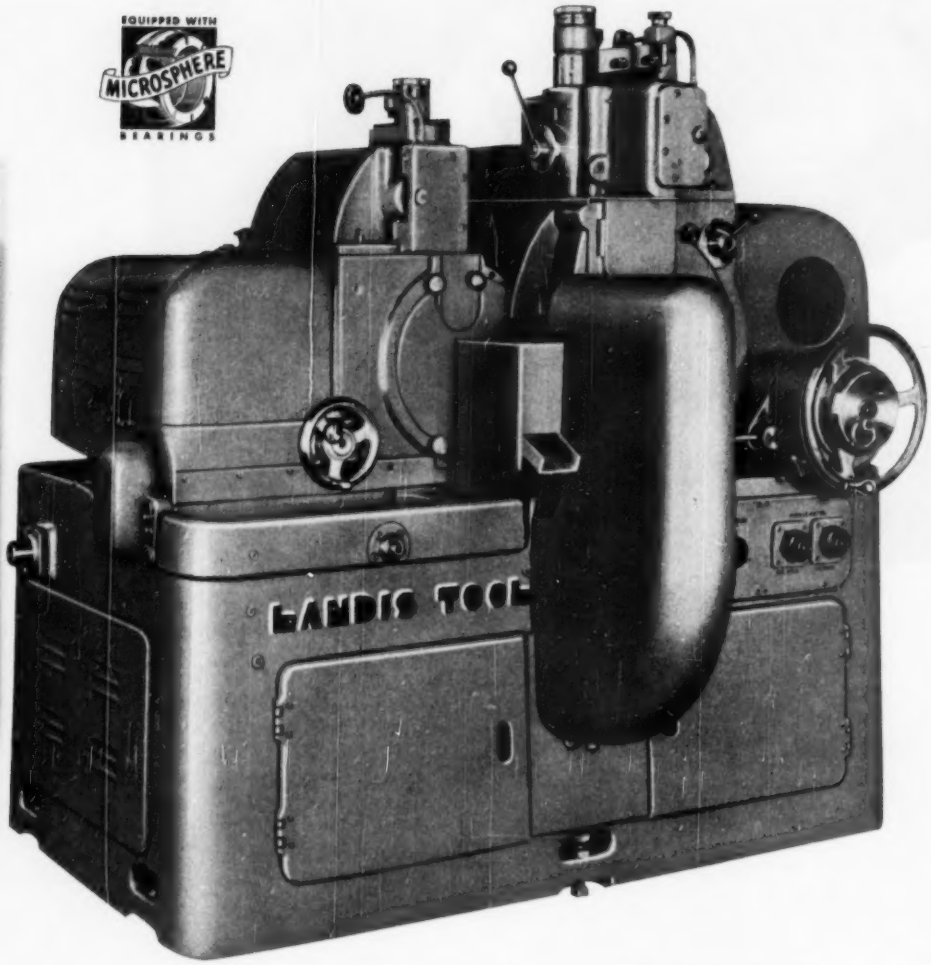
LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

LANDIS TOOL

precision centerless grinders

EQUIPPED WITH MICROSPHERE BEARINGS

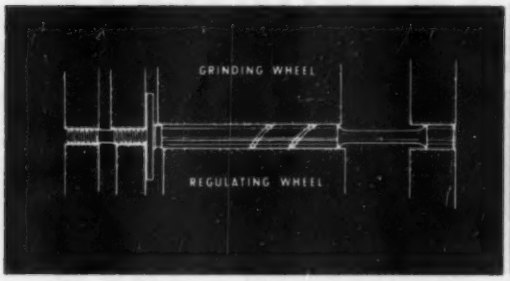


115 No. 12—Landis Tool Centerless Grinder with Timed Cycle Loader; Catalog T47

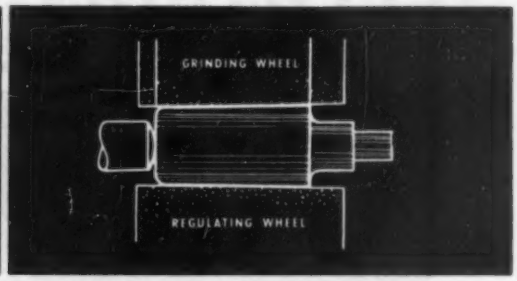
LANDIS TOOL *Precision Grinders*

Production estimates and tooling recommendations will be supplied on the basis of your blueprints.

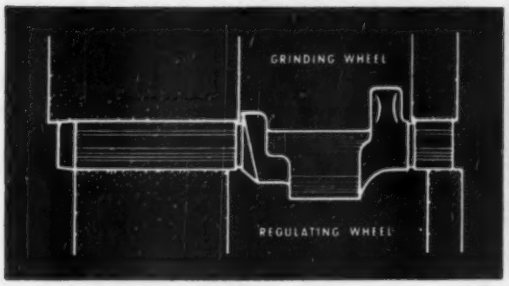
Cost reduction ideas for infeed grinding



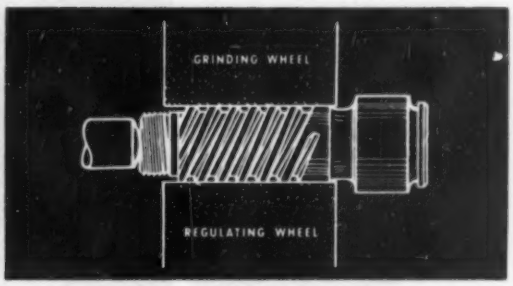
SPACED WHEEL GRINDING. With vertical power operated work loader.



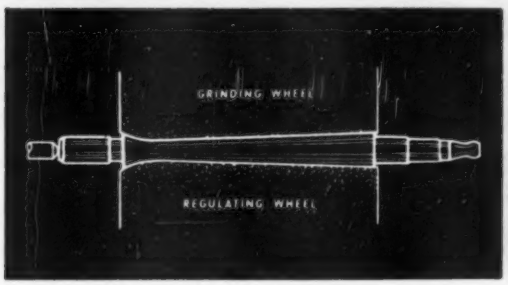
TAPER GRINDING. By merely swiveling the regulating wheel base.



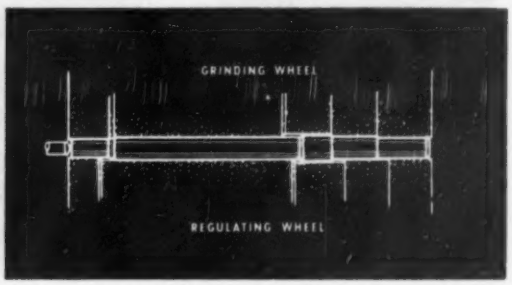
CRANKSHAFT GRINDING. With spaced wheels to clear projections.



GRINDING O.D. OF THREADS. High production with timed cycle loader.



FORM GRINDING. Both wheels profile dressed to shape.



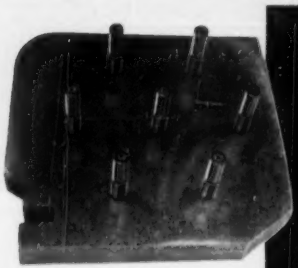
MULTIPLE DIAMETER GRINDING. 5 diameters concentric in one operation.

Special Tooling
Available for High Production Infeed Grinding.

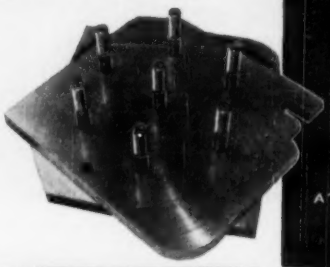
WORK STOPS.
WORK EJECTORS. Hand or Air Operated.
PROFILE BAR DRESSING. Grinding and Regulating Wheel.
AUTOMATIC GRINDING CYCLES.
TIMED CYCLE LOADERS.
HAND OPERATED LOADERS.
VERTICAL LOADERS.

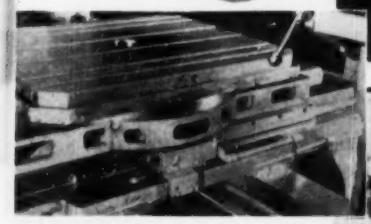
LANDIS TOOL COMPANY • WAYNESBORO, PENNA., U.S.A.

new, quick-acting
ELECTRICALLY-OPERATED

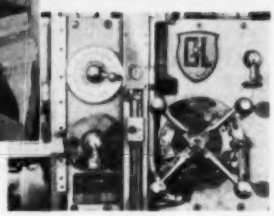


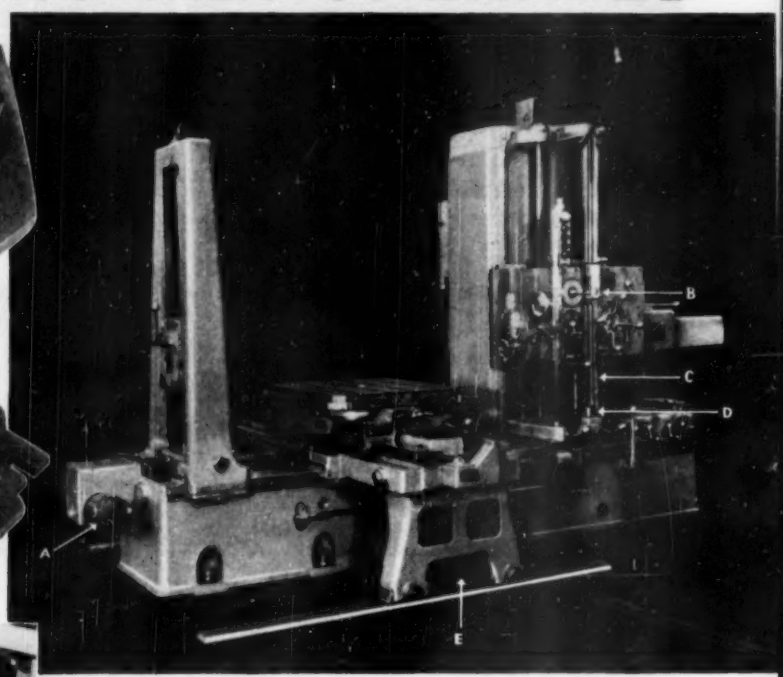
Regardless of the position of the plates, gauge plugs fit easily into the bored holes. Center distances and bore relationship are maintained with jig borer accuracy. Eight holes bored in each plate—drilling, semi-finish and finish boring required: 1 hr., 10 min.





Precision measuring rod in place on G. & L. machine table. Rod trips master switch to activate automatic positioning device.



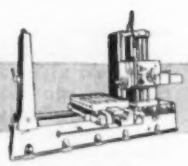


New Giddings & Lewis Series 300-RT Rotary Table-Type Horizontal Boring, Drilling and Milling Machine equipped with automatic positioning device. (A) Constant speed motor gear reduction unit and magnetic clutch used to drive machine feed screw. (B) Selector switch and dial indicator for headstock. (C) Vertical shaft for holding measuring rods or job rods. (D) Adjustable stop. (E) Auxiliary saddle supports and runways required on all machines equipped with automatic positioning device.

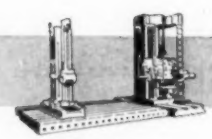
Dial indicator, master switch and adjustable stop arrangement on G. & L. machine headstock to control vertical movement.

GIDDINGS & LEWIS
FOND DU LAC

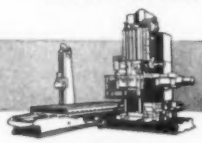
G&L HYPRO



G. & L. Table Type Horizontal Boring Machine



G. & L. Floor Type Horizontal Boring Machine



G. & L. Planer Type Horizontal Boring Machine

G&L POSITIONING DEVICE

PATENT APPLIED FOR

Assures Positive and Accurate Table and Headstock Settings Automatically— Ends Time-Consuming Manual Adjustment for Precision Machining Operations

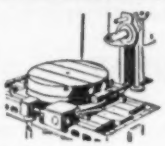
Why waste valuable time by laying out work routed to your G. & L. machine? This time-consuming preliminary work is unnecessary—even for precision boring operations—provided the machine is equipped with the *new* G. & L. electrically-operated positioning device. With this positive and automatic unit, horizontal boring machine table and headstock fine feed movements are mechanically controlled to predetermined settings without depending upon final hand adjustments. Headstock or table can be operated simultaneously or independently, depending upon the job. When positioning, the operator engages rapid traverse to headstock or table, or both. When contact is made with the master switch, rapid traverse is automatically disengaged and separate motor-driven units feed the table and headstock to precise locations.

Equally Efficient for a Single Workpiece or Parts Produced in Lots

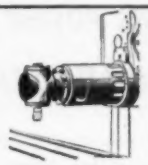
The quick-acting device materially reduces the time taken to locate work for precision machining operations. In addition to this time saved, it eliminates the need for special jigs and fixtures. Accuracy of the device also lessens the responsibility of the operator when establishing machine settings for precision machining or checking operations. End measures, job rods or other means may be employed for measuring between bores, depending on the nature of the work.

OTHER PROFIT-PRODUCING G. & L. ACCESSORIES and ATTACHMENTS

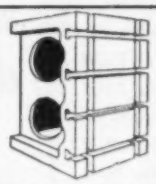
There is a simple and practical way to handle most jobs. Experienced G. & L. engineers will work with you in solving standard and special machining problems.



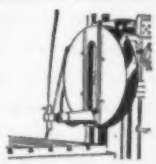
ROTARY TABLES — are designed to reduce the number of work set-ups. By using any of the plain, power or hand feed rotary tables, numerous work surfaces may be quickly rotated into correct machining position without resetting.



ANGULAR MILLING ATTACHMENTS — will perform a variety of milling, drilling, boring and reaming operations at right angle to the machine spindle. Through their use, a large number of machining operations may be accomplished without disturbing the original work setting.



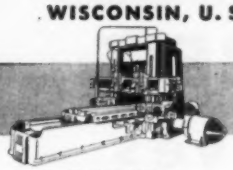
BOX TYPE ANGLE PLATES — are one of a group of holding attachments which simplify the setting up and machining of certain work. Angle plates provide a solid support and permit setting work on a vertical surface at right angles or parallel to the spindle axis.



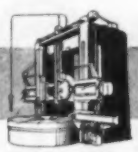
CONTINUOUS FEED FACING HEADS — have been developed to perform boring, facing, turning, backfacing, threading, and similar operations on unusual or complex work. They are useful in machining surfaces which cannot be handled within the usual working range of the horizontal boring machine.

MACHINE TOOL COMPANY

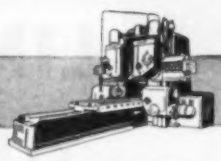
WISCONSIN, U. S. A.



Cincinnati Hypro Double Housing Planer



Cincinnati Hypro Vertical Boring and Turning Mill



Cincinnati Hypro Planer Type Milling Machine

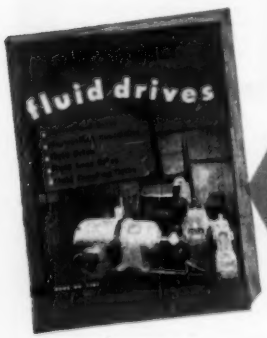
G. & L. Vertical Plastics Injection Press

DAVIS — Complete Tooling Service

8 Link-Belt Electrofluid Drives vertically mounted, testing outboard motors. This method avoids breakage, even when extra light power-head is being tested.

MADE IN 5 TYPES

The Electrofluid Drive is one of five different types in which Link-Belt Fluid Drives are available. Book No. 2385 describes and suggests applications for the Electrofluid Drive, the Electrofluid Gearmotor, the Fluid Drive, the Fluid Gear Drive and the Fluid Coupling Drive. You'll find this information valuable. Send for your copy NOW.



Send now for Book 2385, with full details and application data.

LINK-BELT FLUID DRIVES

- SMOOTH OUT SHOCK LOADS
- PROTECT MOTORS AND DRIVEN MACHINERY
- REDUCE POWER CONSUMPTION
- ELIMINATE BREAKDOWNS

Heavy duty machine tools, long conveyors and similar load applications present the severe drive conditions Link-Belt Fluid Drives were developed to meet. Cushioning effect of the drive permits the motor to gain speed smoothly, rapidly, under low torque, keeping starting current at a minimum and permitting the use of a smaller motor than would be feasible otherwise. Gears, chains, belts and speed reducers in the driven mechanism are protected against strain or impact. Overloads will not stall motor, but will slow it down until protective relay trips; the Fluid Drive will resume operation when jam or overload is cleared.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices, Factory Branch Stores and Distributors in Principal Cities. 11.985

LINK-BELT

fluid drives

Try Your Luck In Untried Pools!

. . . You may Land a Big One that you never counted on

You may get a strike that will amaze you . . . and your customers, too. You may net a whopper that will weigh up to be *the biggest sales advantage your product ever had* . . . the hidden ability to count to your customers' advantage. Like the milling machine builder who found he could build-in a Veeder-Root Counter to pre-set and control depth of cut.

And on such fishing expeditions, V-R engineers are expert (and remarkably successful) guides. When do you want to try *your* luck? Just write.

Series 1200 Magnetic Counters (for AC & DC), widely used with photo-electric relays or electric-eye equipment. These and scores of other electrical and mechanical counters are shown in FREE 8-page "COUNT BOOK" below. Send for your copy, *today*.

Veeder-Root COUNTERS

"Count Everything on Earth"

VEEDER-ROOT INC., HARTFORD 2, CONN.

Veeder-Root Inc., Hartford 2, Conn., (NEW Telephone Number: HArtford 7-7201)

In Canada: Veeder-Root of Canada, Ltd., 935 St. James Street, Montreal 3
In Great Britain: Veeder-Root Ltd., Kilspindie Rd., Dundee, Scotland

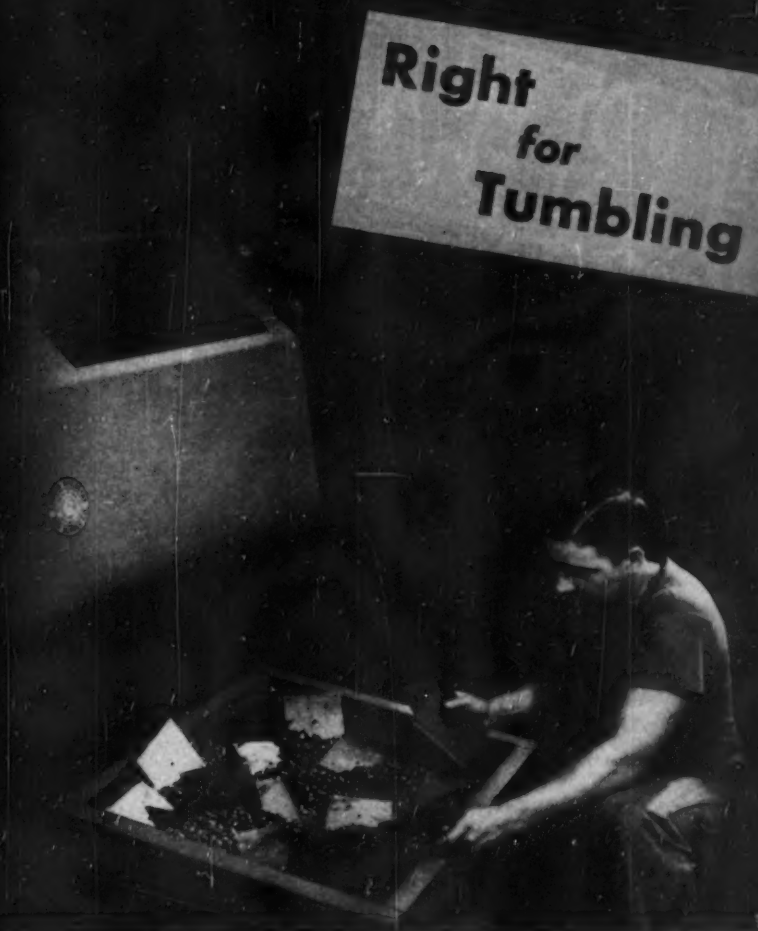
Reduce Finishing Costs

ALUNDUM Polishing Abrasive is available in a wide range of sizes and with special surface treatments to meet the exact requirements of every polishing job. For helpful polishing tips and for full details on cost-cutting ALUNDUM abrasive see your Norton distributor — or write for a free copy of the booklet "Setting-up Metal Polishing Wheels and Belts."

NORTON COMPANY, WORCESTER 6, MASS.

Distributors in All Principal Cities

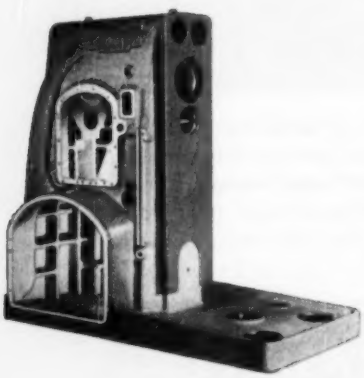
with ALUNDUM Abrasive!



ALUNDUM Tumbling Abrasive is an ideal tumbling medium because—it's ***all abrasive*** for a continuous cutting action—it's ***heavy*** for the fast, positive cut—it's ***hard and tough*** for a long productive life. Let Norton engineering service give you full details on barrel finishing; also write for the new, revised booklet now on the press.

NORTON ABRASIVES

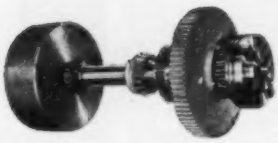
GREATER RIGIDITY



KEARNEY & TRECKER MILWAUKEE **CK's**

FROM overarms to column base, Kearney & Trecker CK milling machines are NEW! Look them over. You'll find these machines give you "more" of every desirable feature you need to make them more productive, more profitable for you. *Talk about rigidity* — these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more of dense, high-test iron, scientifically distributed in closer heavier ribbing, in box section, sponson construction . . . to effectively absorb vibration from the heaviest cutting loads.

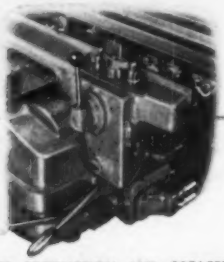
Replacement of obsolete machine tools is an



GREATER CUTTING EFFICIENCY — Added momentum of spindle-mounted flywheel assures longer cutter life and greater efficiency, through smoother, more positive drive — a key to most efficient use of modern cutting tools. Spindle rigidly supported by Kearney & Trecker's original 3-bearing design.

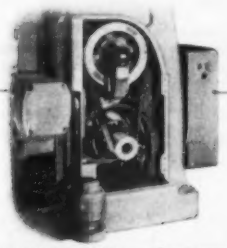
GREATER ADAPTABILITY — No. 60 Heavy Duty drive flange on Nos. 4, 5 and 6 machines enables use of heavy duty arbors with flange drive for large single or multiple cutter setups; or bolting large face-milling cutters directly to spindle nose. Average setups use standard arbors with No. 50 spindle drive.

NON-GLARE RAPID-SET DIALS — You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a non-glare satin surface with plenty of contrast for legibility of markings. They're easy and quick to set and provide a positive lock at every setting.

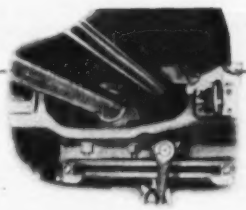


GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE — Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time. Operators will like it because it makes faster, simpler, less fatiguing work for them.

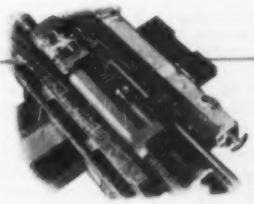
FEEDS AND SPEEDS TO TAKE FULL ADVANTAGE OF MODERN CUTTING TOOLS — and you really can do it with the broad feed and speed ranges on Kearney & Trecker's new CK milling machines. You get 24 spindle speeds (15 to 1500 rpm on Nos. 2 and 3, 13 to 1300 rpm on Nos. 4, 5 and 6) with Kearney & Trecker's automatic protecto-mesh shift to eliminate gear clashing. And there's the extra-wide feed range — 32 changes from ½" to 90" per minute—with separate 3 or 5 hp feed and rapid traverse drive.



GREATER HORSEPOWER — where you need it. That's what you get with new CK independent motor drives for spindle and for feed and rapid traverse. Depending on machine size (Nos. 2, 3, 4, 5 or 6), machines range from 10 to 25 hp for spindle drive and 3 to 5 hp for feed and rapid traverse.



SMOOTHER FEED PERFORMANCE — with a new design 2" diam. heavy-duty, table feed screw that affords greater bearing contact and runs through an extra-long table feed nut. These new CK machines are equipped with a backlash eliminator for more effective climb milling, more accuracy and longer screw life.

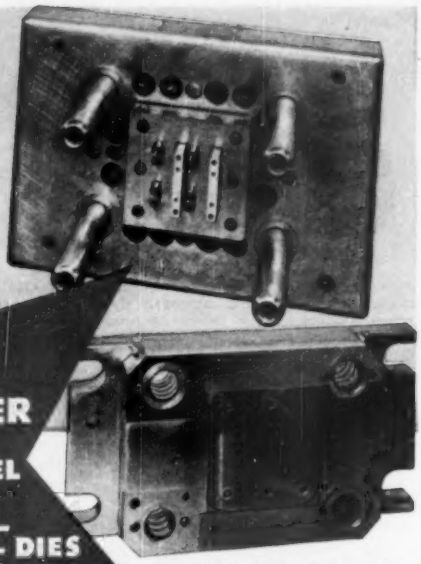


GREATER MACHINE LIFE — through automatic lubrication and generously proportioned gears and shafts throughout for overload conditions. There's a forced flood system in the column and knee, and a positive metered, pressure pump system for table, saddle and knee ways, and table feed assembly.

Kearney & Trecker's new CK Line is designed to meet every demand of present-day milling operations . . . making CK machines more accurate, and MORE PRODUCTIVE for you. Contact your nearest Kearney & Trecker representative or write direct to obtain complete specifications of these fine new machines. See how they easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

investment that makes both Dollars and Sense.

Surface grinding a punch without removing guide pins.



Carbide die and punch ground to a surface finish of 1½ micro inches, using 150 grit diamond cup wheel.

STAR PERFORMER

ON HIGH SPEED STEEL AND *CARBIDE* DIES

TIME SAVER—COST CUTTER

ELIMINATES DIE DISASSEMBLY AND REASSEMBLY

GREATLY REDUCES PRESS DOWN-TIME

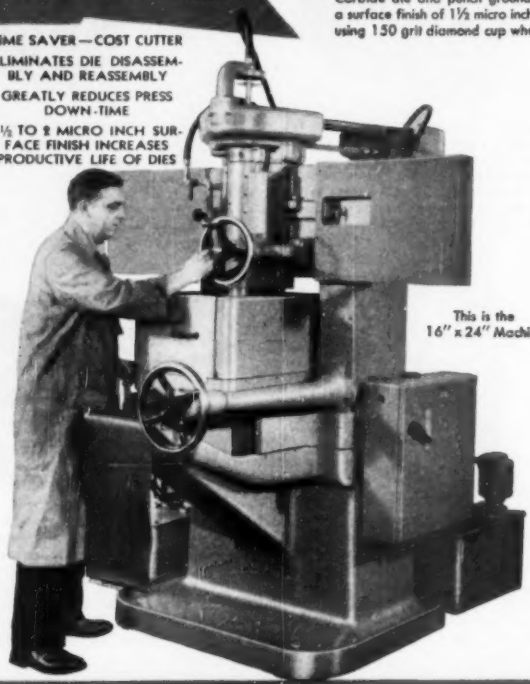
1½ TO 2 MICRO INCH SURFACE FINISH INCREASES PRODUCTIVE LIFE OF DIES

THE ENTIRELY *NEW* PRATT & WHITNEY DIE AND SURFACE GRINDER

Brings new conveniences, new speeds, new economies in the surface grinding of dies and tools of CARBIDE or tough die steels. Specifically designed for facing new die blocks, reconditioning dulled impression edges and preparing worn dies for resinking.

Operating like a profiler, it readily finishes flats around irregular reliefs . . . and is ideal for precision step grinding. Produces 1½ to 2 micro inch surface finish . . . eliminates need for lapping or polishing . . . holds breakdown of cutting edges to a minimum . . . increases productive life of die set between grinds . . . reduces press down-time.

Smooth hydraulic table drive gives exactly the right speed for the job up to 20 f.p.m. . . . three spindle speeds permit the use of different diameter wheels . . . compact, vertical design conserves floor space. Write for the full details.



This is the 16" x 24" Machine.

PRATT & WHITNEY

Division Niles-Bement-Pond Company
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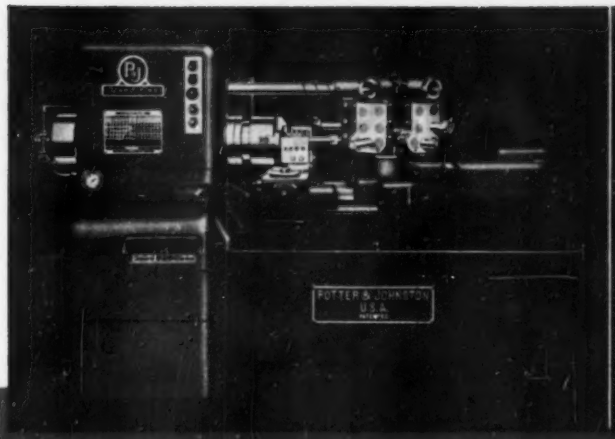
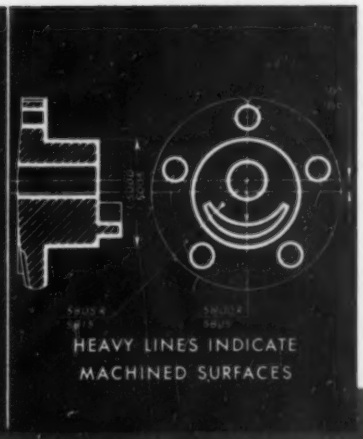
MACHINE TOOLS • CUTTING TOOLS • GAGES

90th Year

SYMBOL OF ACCURACY SINCE 1860





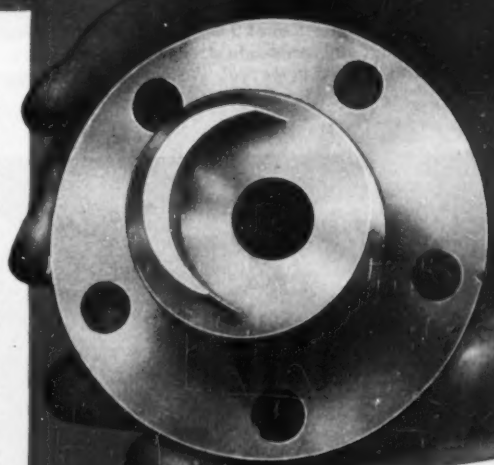
IT TAKES THE P&J 3U AUTOMATIC TO TURN OUT THIS CLASS OF WORK *PROFITABLY*

for the TUTHILL PUMP CO.

Here's why:

The P&J 3U Speedflex Automatic Turret Lathe has proved itself a most efficient tool to perform some 21 precision operations in record time on this pump part, *including the eccentric bore and the simultaneous drilling of five holes.* It's the finest of Automatic Turret Lathes for profitably machining small castings and forgings.

Set up with skillful P&J-engineered Tooling, it produces better work, and more of it with fewer rejects. It increases productivity by combining cuts and eliminating extra work handling. It reduces labor costs because one operator easily handles a battery of these fully automatic, high speed Machines. P&J will gladly estimate on *your* small parts production; simply send us sample parts or prints.



P&J 50 YEARS' EXPERIENCE IN TOOLING FOR

Precision + Productivity + Economy

POTTER & JOHNSTON CO.

PAWTUCKET, R. I.

subsidiary of PRATT & WHITNEY

Division Niles-Bement-Pond Company

P&J

Carilloy "T" Steel greatly

ON THE MARION 5561 — WORLD'S LARGEST POWER SHOVEL

THE mammoth 45 cubic yard bucket on Hanna's "Groundhog" is moving more than a million yards of overburden every month. Despite the exceptional punishment it receives, the U·S·S CARILLOY T-Steel lip-plate has already been in service much longer than any steel previously used.

Further, the higher physical properties of T-Steel have made possible design changes which are now under way and which should greatly extend lip life beyond present construction.

Here's what Hanna Coal Company says, as owner and operator, "The lip of this bucket (made from 4½" CARILLOY T-Steel) is one of the most critical sections and it takes a great deal of punishment when loading the rock strata we have at this location. At Marion Power Shovel Co., we have a *50-yard* bucket on order. It will be built almost entirely of T-Steel . . ."

In this new bucket, CARILLOY T-Steel will increase capacity 5 yards — almost *9 tons* — by cutting weight without any sacrifice in strength. And because it can be welded *in the field*, T-Steel construction makes it unnecessary to shut the shovel down for the many hours formerly required for shop repairs.

CARILLOY T-Steel, a product of United States Steel research, is a *low carbon* alloy steel, heat-treated with great precision. Minimum yield strength is 100,000 psi (for plates ¼" to 2" inc.) Furthermore, T-Steel will remain ductile at arctic temperatures—*even after welding.*

Welding does not lower the strength of the plate. If AWS electrodes E-12015 or E-12016 are used, welds remain 100% strong . . . both butt and fillet-welded specimens will break completely outside of the heat-affected area. As for toughness, laboratory tests have proved that, even after gas-cutting, T-Steel can be bent at more than 100°F. below zero.

CARILLOY T-Steel is normally produced in the forms of plates and bars. Nominal hardness is 250 Brinell, although 321 minimum Brinell can be furnished for abrasive conditions where a combination of high hardness, toughness and weldability is essential.

increases lip-plate life

MECHANICAL PROPERTIES—U·S·S Carilloy T-1 Steel Plates can be furnished Heat Treated to the following mechanical properties:

	Thickness ¼" to 2" incl.	Thickness Over 2" to 4" incl.	Thickness Over 4" to 6" incl.
Yield Strength, 2% Offset (min.)	100,000 psi	90,000 psi	90,000 psi
Tensile Strength (min.)	115,000 psi	105,000 psi	105,000 psi
Elongation in 2", % (min.)	18	17	16
Reduction of Area, % (min.)	55	50	45
	Thickness ⅛" to ½" incl.	**Thickness Over ½" to 1" incl.**	**Thickness Over 1" to 2" incl.**
Cold Bend	180°D=1t	180°D=2t	180°D=3t

(Testing in accord with A.S.T.M. recommended practices.)

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH

COLUMBIA STEEL COMPANY, SAN FRANCISCO • TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM

UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

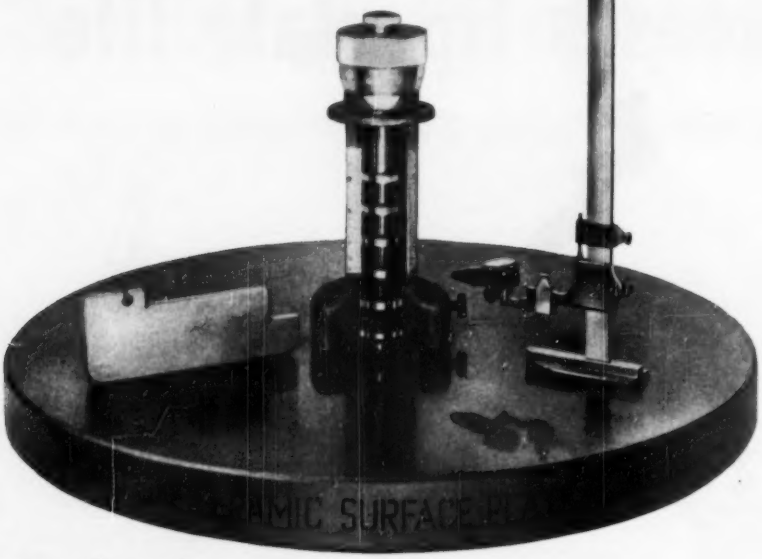
USS

Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH • COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

UNITED STATES STEEL

A Better Surface Plate by far . .



Better by far . . .

because it has so many superior qualities

CHECK THESE IMPORTANT QUALITIES and you'll see how Norton Ceramic Surface Plates will speed up precision checking and cut costs in your plant.

☑ ***LONG LIFE*** is guaranteed for these wear-resistant plates which are made of a material harder than any other type of surface plate. Laboratory and field tests proved wearability was 40 to 1 over best competing type.

☑ ***PRECISION FLATNESS*** of the Norton Ceramic Surface Plate has been found preferable for precision checking operations. Made of a durable and stable material, the ceramic plate stays flat. It will not warp or deform; it will not deflect under load.

☑ ***LESS WEAR OF EXPENSIVE INSTRUMENTS,*** gage blocks and sine bars has proved to be another cost-saving-feature of these ceramic surface plates. The continuously smooth surface allows easy movement of instruments and work across the plate.

NORTON COMPANY
Worcester 6, Massachusetts

☑ ***NON-CORROSIVE.*** The Norton Ceramic Surface Plate will never sweat nor corrode. It does not require greasing or protection from moisture.

☑ ***NON-MAGNETIC*** quality of these ceramic surface plates often proves to be another time-saving feature.

☑ ***LIGHT WEIGHT*** of Norton surface plates permits easy mobility from one checking operation to another. These plates can be finished both sides and their lightness permits easy turning for double utility.

☑ ***BETTER FOR BLUEING.*** The light colored surface of the Norton Ceramic Surface Plate reflects light better for blueing than do dark plates. The special surface texture permits a uniform film to be transferred from plate to work. The blueing mix spreads easily, is moist longer.

☑ ***LOWER MAINTENANCE COSTS*** are obviously the result of using these extremely wear-resistant plates which retain their precision surface finish through years of daily, severe use. The plate is easily cleaned with soap powder and water.

☑ ***CENTER HOLE FOR GAGE SHANK.*** The larger sizes of the Norton Ceramic Surface Plate are made with a center hole which in many checking operations is used to hold the gage shank or center post.

☑ ***FASTER, MORE ACCURATE READINGS*** can be obtained with this ceramic surface plate because the precisely flat and smooth surface permits accurate, duplicate readings to be made quickly.

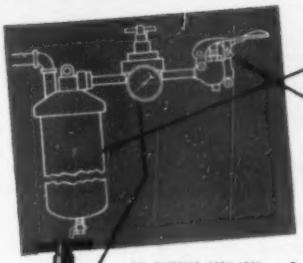
For price information write for free Bulletin No. 1036

NORTON

CERAMIC SURFACE PLATES

START with
IMPROVE with
REPLACE with

genuine Schrader Air Line Accessories

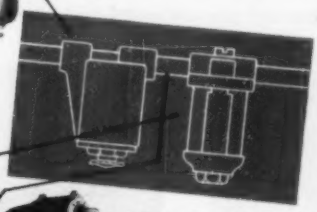


NEW AIR LINE FILTER AND WATER TRAP—One of finest devices developed for removing dirt, scale, rust, chips, and moisture from air lines without restricting air flow. Large capacity. Can be connected permanently to drain. Easy to clean without removing from position.

AIR OPERATING VALVE—One of dozens of Schrader valves for controlling air flow—2, 3, 4-way; hand, foot, or remote controlled.

NEW AIR LINE FILTER — Small inexpensive filter cleans air, removes moisture. Delivers full flow long time between cleanings.

AIR PRESSURE REGULATOR — Reduces air line pressure to tool requirements. Will go down to zero. Saves tools. Prevents waste of high pressure air. Available with or without gauge.



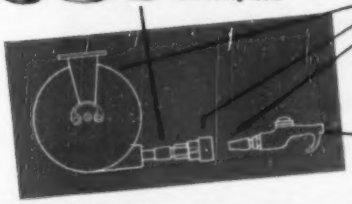
NEW AIR LINE LUBRICATOR—Automatically lubricates air cylinders, chucks, clamps, pilot valves or any other air-operated equipment. No moving parts. Any pneumatic unit will operate longer without maintenance if properly lubricated.

HOSE REELS — One of several open and closed types of Schrader Hose Reels. Universal mounting. Automatic rewind. Keep hose out of harm's way.

FITTED HOSE LENGTHS — The easy way to buy air hose—in fitted lengths tailored to your requirements. Male, female or adapter ends. Oil-resisting hose. Or buy hose and fittings from Schrader and tailor your own lengths.

HEVI-DUTY COUPLERS, consisting of two parts—a check unit and an adapter. Only simple push required to plug in. Only slight, positive twist of sleeve to remove. Won't disconnect accidentally. Various types and sizes of adapters and check units.

HOSE FERRULES — Precision-made for a neat, tight job. Apply to hose with any of the several Schrader hand or automatic contracting tools.



BLOW GUNS—Three of a very wide variety of blow guns for cleaning work, blowing off chips. Button or lever-operating types, light and heavy duty. Standard regulation noses; also adjustable types to control the air flow.

Write for complete information today.

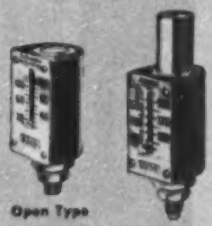
These HYDRAULIC GAUGES can TAKE A BEATING

New Schrader **HYDRODIAL GAUGE**

Pressure Ranges from 5-50 to 500-5000 lbs. Readable 50 ft. away! Clear, durable plastic face.

Where a hydraulic gauge has to lead a tough life, insist on Schrader. These rugged hydraulic gauges withstand shock and overload without losing their efficiency because they're built on the Schrader *Direct Action Principle* and incorporate a built-in snubber.

STANDARD GAUGE



Open Type — Enclosed Type

Pressure ranges 5-50 to 1500-3000 lbs.

HUNDREDS MORE PRODUCTS FOR EFFICIENT AIR CONTROL—In addition to the types of products shown in this advertisement, Schrader also manufactures Air Clamps, Air Cylinders, Ejection Sets, Machine Control Sets, Pilot Valves, Rotating Pressure Joints, Uniflare Tube Fittings.

MAIL THIS COUPON TODAY

A. SCHRADER'S SON, 490 Vanderbilt Ave.
Brooklyn 17, New York
Division of Scovill Manufacturing Company, Incorporated

Schrader
PRODUCTS CONTROL THE AIR

Please send me information and free literature about the products I have checked in the squares at the right.

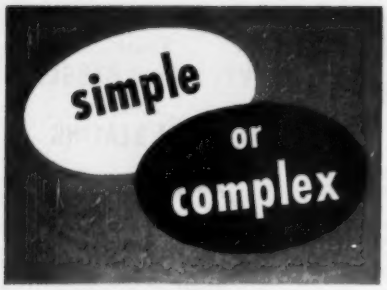
Name _____

Company _____

Address _____

City _____ *Zone* _____ *State* _____

	Check Here
Air Cylinders	
Operating Valves	
Press & Shear Controls	
Air Ejection Sets	
Blow Guns	
Air Line Couplers	
Air Hose & Fittings	
Hose Reels	
Hydraulic Gauges	
Pressure Regulators & Oilers	
Air Strainers	
Uniflare Tube Fittings	



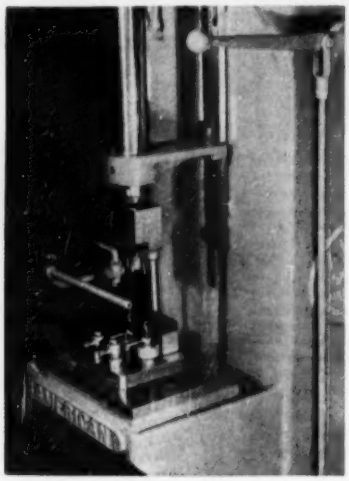
American - ENGINEERED

Broaching Fixtures CUT COSTS

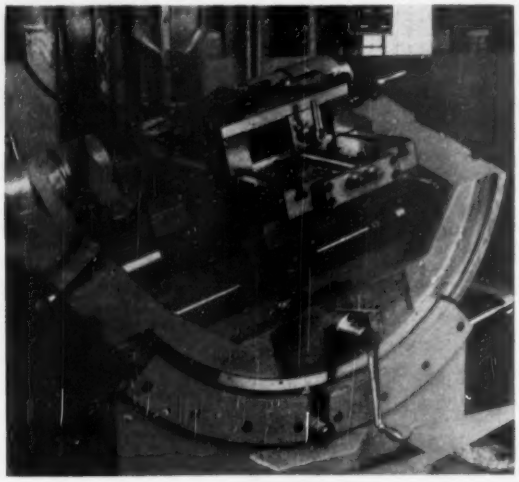
Efficient, economical production is the goal of broaching fixture design. Sometimes this goal is reached best with a simple fixture, designed for complete manual operation. At other times it means a highly complex fixture, engineered for multiple purposes, and equipped for automatic or semi-automatic operation.

The right fixture for your production needs probably lies somewhere between these two extremes. You can be sure of getting the right fixture . . . by having it designed and built by American engineers.

American offers you the advantage of over twenty-five years experience in the design and production of fixtures, broaches and broaching machines. This experience is your assurance of a fixture designed to do your job efficiently and economically. Write for their recommendations. Enclose a part print or sample, hourly requirements and type and model machine to be used. No obligation, of course. Address Dept. A.



This SIMPLE fixture helped one manufacturer cut costs by adapting an American V-1 two ton press to push down broaching of small motor connecting rods. Parts are located from the large hole and swung easily into position. The broaches are arranged to strip back through the work. A plate above the work prevents parts from lifting. An example of how an American-engineered fixture solved a broaching problem.



This COMPLEX fixture permits a milling cutter manufacturer to broach serrations in slots on different sizes of cutters. This versatile fixture permits tilting for helix and conical angles, and adjusting "in and out" as well as laterally to compensate for various sized milling cutters.

Write today for your copy of Catalog No. 450, 32 pages packed with useful, practical broaching information.

AMERICAN

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

92 hrs. of heat treatment

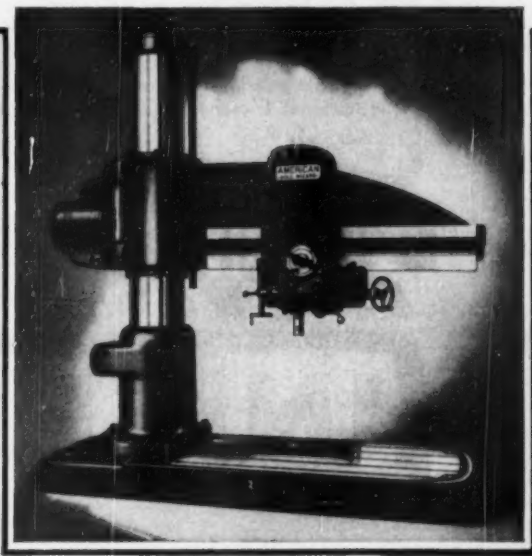
. . . required to produce the ultimate in radial drill spindles

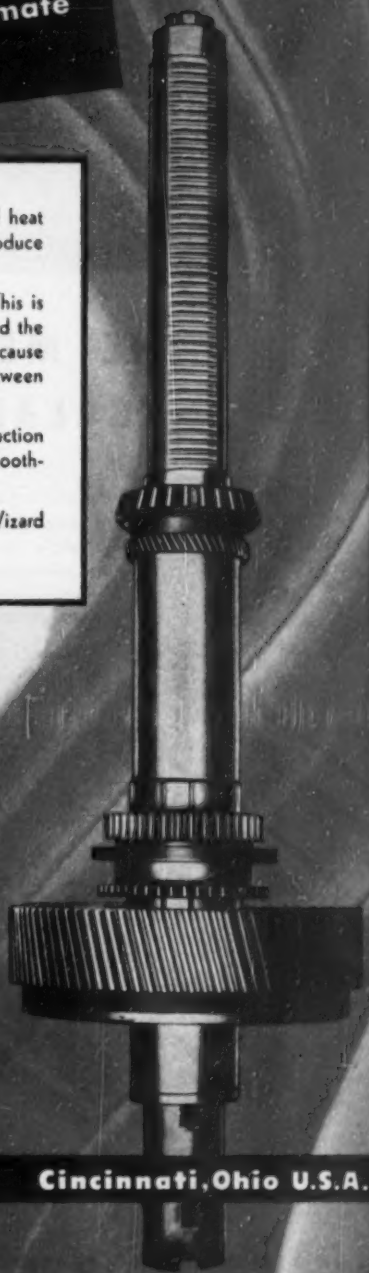
"AMERICAN" Radial Drill Spindles are made of nitralloy. 20 hours of heat treatment from rough to finish, then 72 hours of nitriding are required to produce the wear-resistant spindles used in these radials.

Both the spindles and sleeves are nitrided to 110 degrees scleroscope. This is harder than some grades of cemented carbide. The sleeve is finish honed and the spindle ground and then diamond lapped to a sliding fit in the sleeve. Because of the lack of affinity between these two hard surfaces the clearance between them may be reduced to the very minimum, which in this case is .00025".

This results in the greatest possible stability, resulting in an ideal construction especially for accurate boring operations, which demand a high degree of smoothness and rigidity of the spindle.

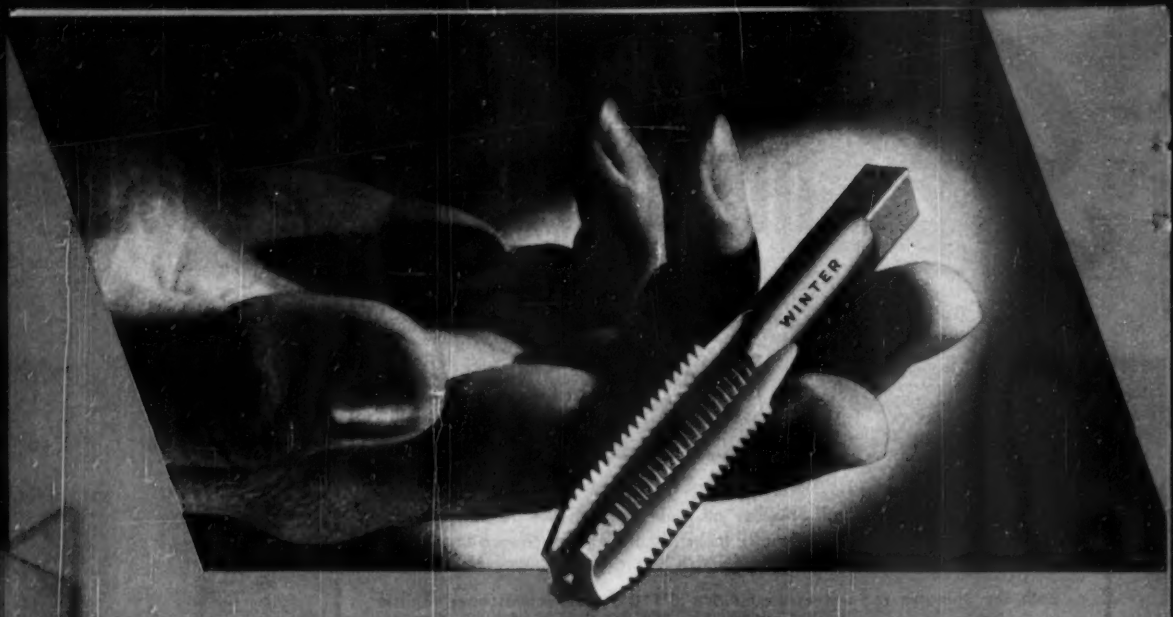
This is but one of the super features that make the "AMERICAN" Hole Wizard an outstanding investment.





THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills



THE MEANING OF WINTER "BALANCED ACTION"

"Balanced Action"—built into all Winter Taps—is your assurance of tap performance. Accuracies of diameters, leads, and thread forms are held to extremely close limits. Flute spacings, flute contours, chip driver contours, and chamfers are equally exact. With all these elements held in the right relationship, the result is absolute uniformity of tapped hole sizes—yours with all Winter Taps.

Winter's complete line of taps includes chip driver, hand, machine screw, nut, pipe, pulley, stove bolt, and tapper styles, and a full complement of dies.

ALWAYS AT YOUR SERVICE—YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company
Rochester, Michigan, U. S. A., Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

NATIONAL TWIST DRILL & TOOL — ROCHESTER, MICH. U.S.A.

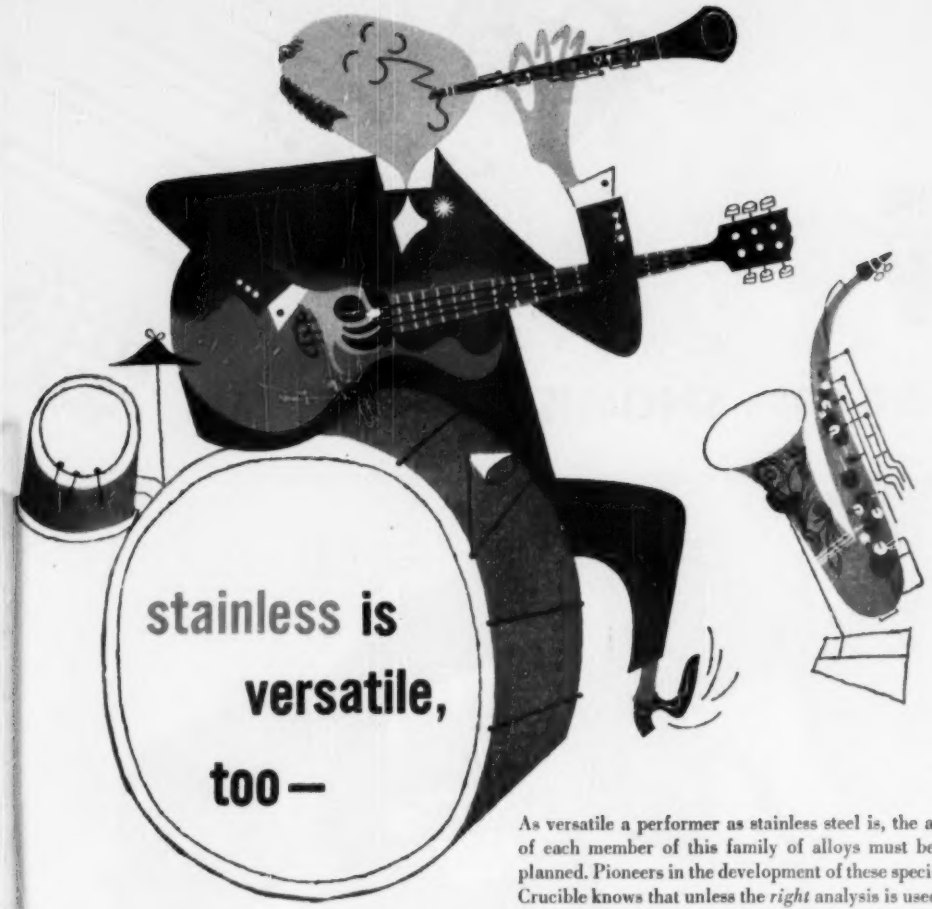
National

CUTTING TOOL SPECIALISTS AT YOUR CALL

National Cutting Tool Specialists are familiar with all phases of metal cutting tool operation. They have a background of factory training and field experience, combined with expert knowledge of the latest developments in metal working. There is a National Cutting Tool Specialist located conveniently near you. He will help you get the best results from National's complete line of rotary metal cutting tools, which includes twist drills, reamers, counterbores, milling cutters, end mills, hobs, and special tools.

"CALL YOUR DISTRIBUTOR"—It is NATIONAL'S firm belief, based on long experience, that the local industrial distributor is the one best source for all staple industrial needs—including NATIONAL Metal Cutting Tools.

NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U. S. A.
Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco



As versatile a performer as stainless steel is, the application of each member of this family of alloys must be carefully planned. Pioneers in the development of these specialty steels, Crucible knows that unless the *right* analysis is used, stainless may prove disappointing. That's why Crucible offers you the services of an alert staff of metallurgists and engineers to help you apply stainless . . . properly. These engineers and metallurgists have all the wealth of experience that Crucible's half century of specialty steel leadership provides . . . take full advantage of it.

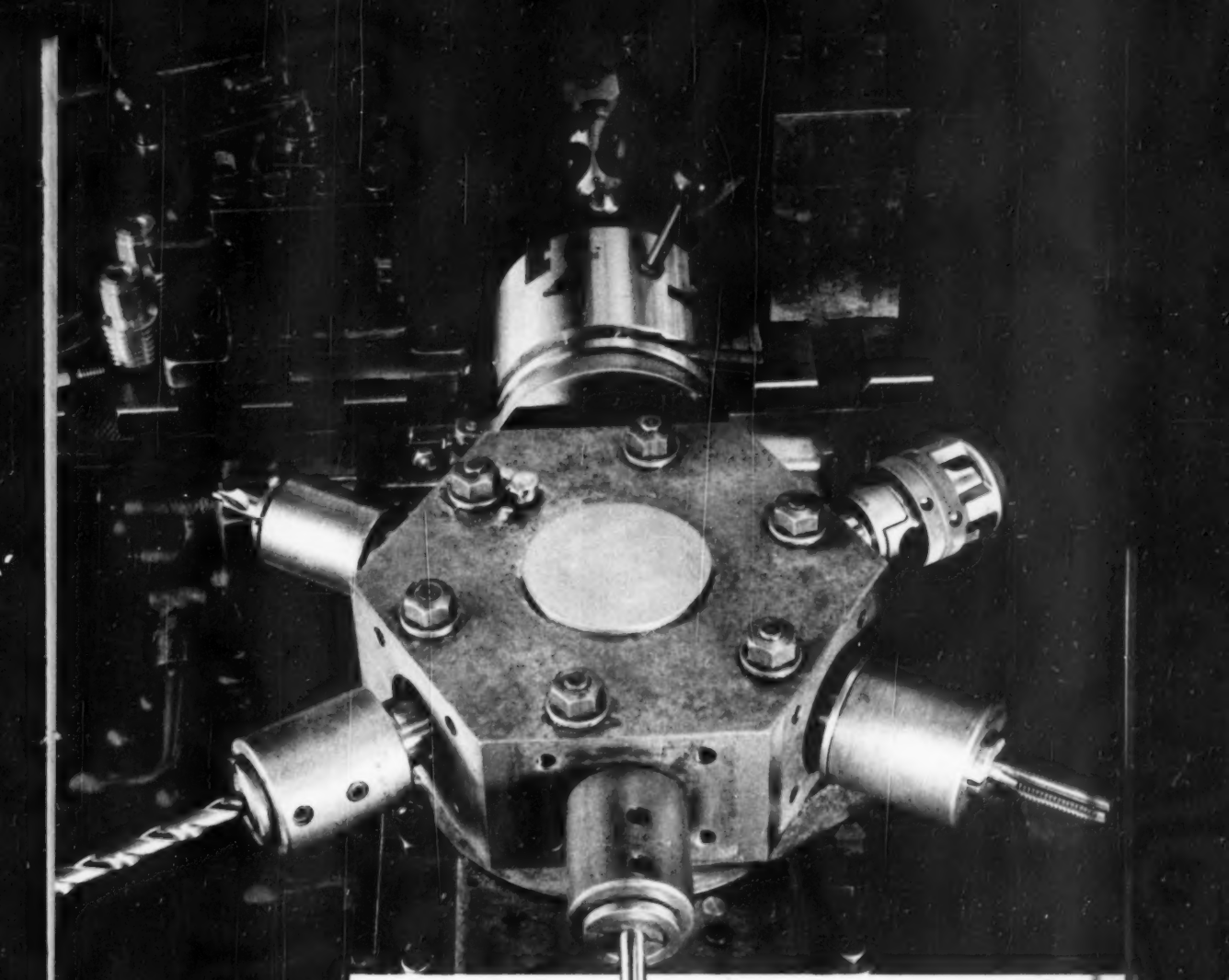
Whatever your stainless application may be, Crucible is prepared to help you. Whether the order is in pounds or tons, Crucible tackles every industry-posed problem with a keen devotion to detail. If you're thinking of stainless . . . call in Crucible. CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

CRUCIBLE **first name in special purpose steels**

STAINLESS STEELS

fifty years of Fine steelmaking

STAINLESS • HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS



and gages too!

Yes, only GREENFIELD with its GEOMETRIC Division manufactures in its own plants, a complete line of Cutting Tools plus Gages! Yes, only GREENFIELD could duplicate the above tooling and top it off with all necessary Gages.

REGULAR STOCK ITEMS

	Capacity From	Capacity To		Capacity From	Capacity To
TAPS and COLLAPSING TAPS	0-80	8½"-8	DRILLS	#80	3½"
DIES and DIE HEADS	0-80	6"-7	REAMERS	7/0	2½"
GAGES—THREAD	0-80	1½"-6	END MILLS	1/16"	2"
GAGES—PLAIN	.059"	4.510"			

BUY TOOLS WITH *CONFIDENCE* BUY *GREENFIELD* TOOLS

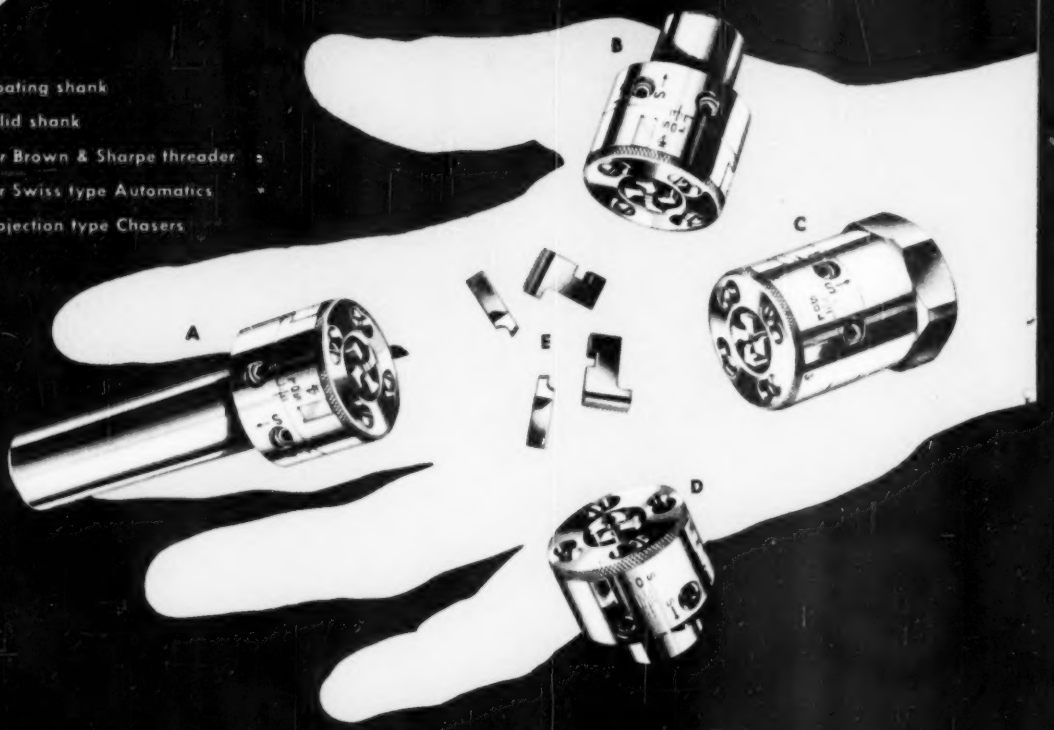
GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

Geometric "EJ5"

THE MIDGET SOLID ADJUSTABLE DIE HEAD

A. Floating shank
B. Solid shank
C. For Brown & Sharpe threader
D. For Swiss type Automatics
E. Projection type Chasers



Tiny? Yes, these four solid adjustable die heads, shown actual size, easily fit in a man's hand yet, when it comes to producing quality threads they're giants. Their precision finish, simple construction and easy action make them a favorite wherever small, fine pitch threading is done.

Capacity 1/16" to 3/16" as fine as 80 pitch.

WRITE FOR LATEST BULLETIN

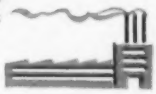
BE SURE Buy GEOMETRIC

GEOMETRIC TOOL COMPANY DIVISION

GREENFIELD TAP AND DIE CORPORATION

NEW HAVEN 15, CONNECTICUT

Up a Stump

This designer had a brainstorm . . . a compact electric fan for travelers. He explained to the shop foreman how magnesium castings would make it feather-light, yet strong as ordinary fans. But the shopman had no experience machining magnesium — thought he'd be up a stump. So together, they came to light-metal headquarters, Aluminum Company of America.  They learned the simple procedures that make handling magnesium easy. They learned from free books on designing and fabricating, the techniques of working with this lightest and easiest to machine of all commercial metals. They learned that other manufacturers use over three million pounds of magnesium every month. They put the fan into production. The bodies they had die cast by Alcoa at a very attractive price. Easy handling and assembly cut production costs. And the sales manager says selling these lightweights is a breeze.

These two free books on magnesium and our broad technical knowledge can help your products, too. Write Aluminum Company of America, 2106M Gulf Building, Pittsburgh 19, Pa. Sales offices in principal cities.

ALCOA

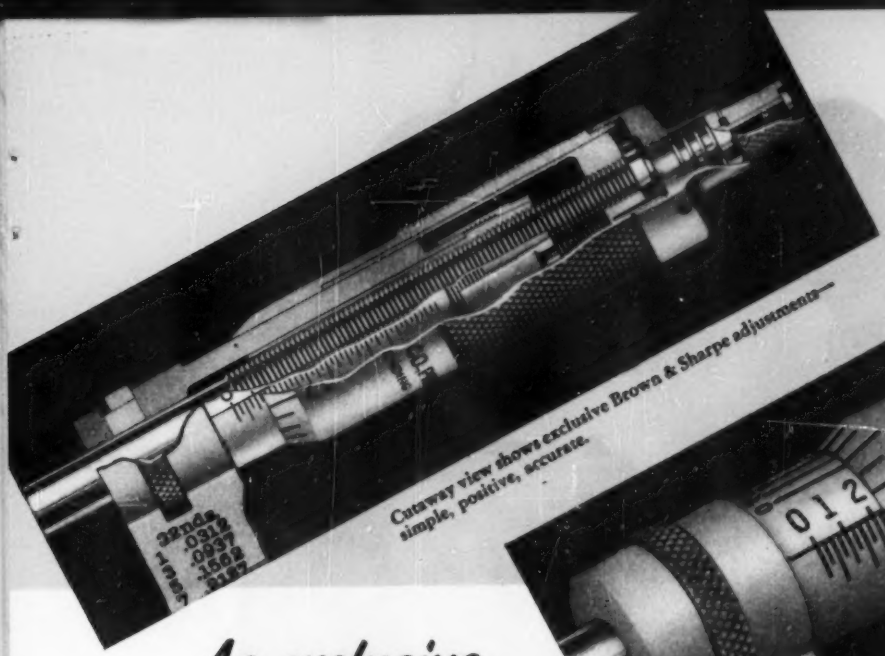
ALUMINUM and MAGNESIUM

MORSE
163 PLEASANT ST.
America's Foremost
Line of
Cutting Tools
SEASON'S

Merry Christmas
AND A
Happy New Year
YOUR MORSE-FRANCHISED DISTRIBUTOR
AND
MORSE TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASSACHUSETTS

The NEW Brown & Sharpe MICROMETERS

- Black graduations
- Dull chrome finish
- Wide divisions
- Hardened and ground threads
- New sliding taper thread adjustment
- Positively locked screw and thimble
- Quick, easy thimble adjustment
- Rust resistant
- Available in complete range of sizes



Cutaway view shows exclusive Brown & Sharpe adjustments—simple, positive, accurate.

Large diameter thimble provides wide divisions. Easy reading black graduations and figures on rust-resistant dull chrome finish.

An exclusive combination of advanced features!

Never before has a line of micrometers offered such an outstanding combination of advanced features! Improvements throughout the new Brown & Sharpe Micrometers now contribute higher performance to every essential of micrometer service . . . readability, accuracy, ease of adjustment, durability.

Notice the widely-spaced divisions, black graduations and dull chrome finish . . . for easy, accurate reading. Observe the integral spindle and screw with simplified thread adjustment and longitudinal adjustment of thimble on screw. Consider what the long-wearing carbide faces and one-piece stainless steel spindle and screw with hardened and ground threads mean to durability!

Only by actually seeing and holding one of these new micrometers in your own hand can you appreciate all the advantages of these many new features. See them at your hardware store or tool supplier's. Write for illustrated folder describing the completely new line of Brown & Sharpe Micrometers. Brown & Sharpe Mfg. Co., Providence 1, R.I., U.S.A.

We urge buying through the Distributor

Long-wearing carbide measuring faces . . . another Brown & Sharpe contribution to enduring accuracy.

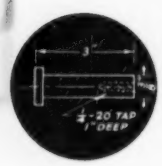
Brown & Sharpe

B·S

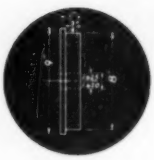
all in a day's work

on the Tray-Top Cintilathe

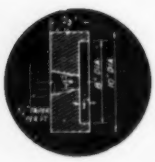
- **Small work diameters, large work diameters**
- **Alloy steels, soft steels, cast irons, non-ferrous metals**
- **Turning, facing, drilling, boring, reaming, threading, tapping**
- **Roughing cuts, finishing cuts**
- **Tools of high speed steel—tools of cemented carbide**



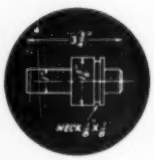
material:	aluminum	
tools:	H.S.S.	
operation	speed	feed
face	1200	.015
turn	1200	.018
ctr. drill	1200	H
drill	1200	H
tap	315	H



material:	CMM 320	
tools:	carbide	
operation	speed	feed
face	608	.018
ctr. drill	1200	H
turn	842	.020
neck	315	H
chamfer	449	H



material:	cast iron	
tools:	carbide	
operation	speed	feed
face	842	.015
turn	842	.018
ctr. drill	842	H
drill ⅞	608	H
drill 1½	161	H
ca-bore	842	.015
taper turn	842	.018



material:	SAE 3150	
tools:	H.S.S.	
operation	speed	feed
face	82	.013
turn	42	.020
ctr. drill	608	H
drill ⅞	608	H
drill 1½	161	H
bore	315	.020
ream	60	H

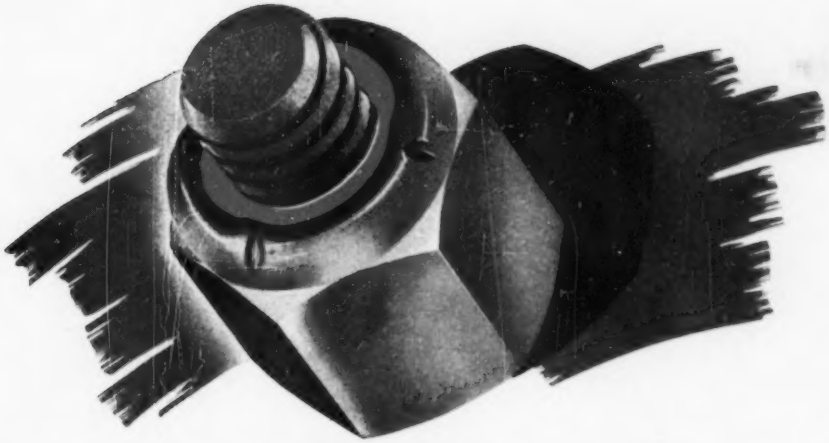
All demand a wide range of spindle speeds! And Tray-Top is the **only** economy-priced light duty lathe that gives you **twelve speeds—all geared**—in geometrical progression, 40 to 1 overall ratio. Quick, 3-lever speed selection with direct-reading "color match" dial. A choice of three speed ranges: 20 to 820, 30 to 1200, 45 to 1800 rpm . . . Totally enclosed quick change gear box . . . 48 thread and feed changes . . . flame hardened gears in headstock, change gear box and apron . . . convenient "parking space" for tools, etc.—these and many other features make Tray-Tops

OF OUTSTANDING VALUE

Write for Bulletin TEL 100-3.

CINCINNATI LATHE & TOOL CO.

Cincinnati 9, Ohio, U.S.A.



ANCHORED *Forever*

•••OR RELEASED IN AN INSTANT!

The efficient Greer *Self-Locking* Nut solves many a tough engineering problem. So simple in principle . . . so easy to apply . . . *YET* so *powerful* in it's unshakable locking grip! It's 100% secure, clamped and *set* against every conceivable vibration! *Best of all*, an ordinary wrench unclamps it again in an instant!

VIBRATION TESTED FOR THOUSANDS OF HOURS

Probably the toughest test of all for GREER *Self-Locking* Stop Nuts is on pneumatic drills. Here they pass thousands of grueling hours of violent vibration with flying colors . . . NOT ONE has shaken loose to our knowledge.

GREER LOCK NUT MEETS THE ANA REQUIREMENTS

Where small but strong fastenings must be applied (and later removed) . . . are subjected to vibration and must stay ABSOLUTELY TIGHT . . . GREER *Self-Locking* Nuts have proved to be ideally suited.

GREER

Self Locking Nuts

GREERCOID COLLAR HAS DUAL ROLE!

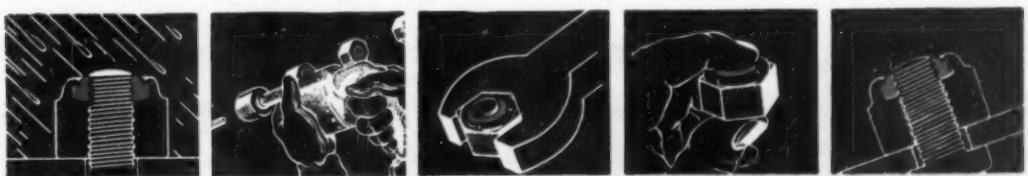
Flexible but extremely tough . . . the Greercoid Built-In Lock has just the right resiliency to "soak up" any "shortwave oscillation" attempting to start between nut and bolt. It also serves as a powerful set-clamp and braking surface. Compression plus flexibility give it an unshakable grip and generate much added holding power in the lower threads also. Greer Stop Nuts are identified by the label on the carton. Meets ANA requirements.

ALL SIZES FOR STANDARD OR SPECIAL THREADS

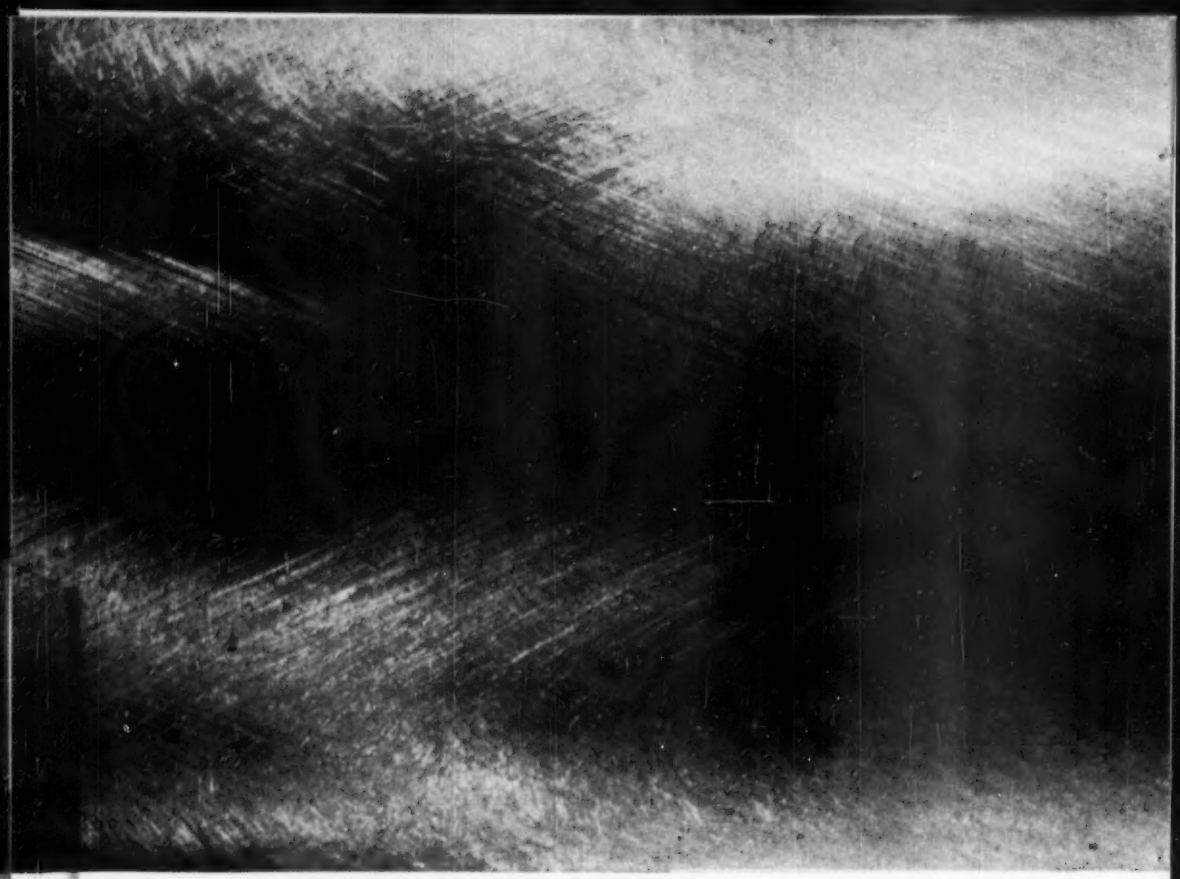
Write today, outlining your needs.

GREER STOP NUT CO.,
2620 W. Flournoy St., Chicago, Ill.

GREER STOP NUTS FOR APPLICATION IN ALL INDUSTRIES



SEALED	FASTER ON	FASTER OFF	RE-USABLE	NO PLAY
Protects working threads.	Tighten, and it's on to stay!	Ordinary wrench does it!	Use them again and again!	Keeps threads tight.



SUPERFINISH—*a money-saving process*

Cuts grinding costs 35% with this *"frosty finish"*

If you have thought of Superfinish as a process which adds to your cost, it's time to change your ideas. The "frosty" finish you see here is by no means beautiful, but it is just what the customer ordered—and it is giving him a better product at a 35% saving.

This is a crankshaft bearing for an Elgin Outboard Motor manufactured by the Hartford Division of the West Bend Aluminum Company exclusively for Sears, Roebuck and Company. The secret has been to alter the grinding operations. Rough grinding is now simplified and speeded up by using a free-cutting wheel. Finish grinding has been replaced by Superfinishing. Both operations are performed at the same production rate and the final finish is 10-12 Micro Inches.

In addition to the saving in manufacturing costs, there are certain quality advantages which must not be overlooked. Grinding peaks have been scrubbed away, leaving a firm bearing surface that requires no breaking in. Grinding chatter is no longer any problem, since the remaining roughness is all below the surface. The cross-hatch pattern of Superfinishing assures adequate distribution of lubricating oil throughout the bearing. It's a better surface—in addition to being less costly to produce.

Write on your company letterhead for a copy of the textbook "Wear and Surface Finish." It's mighty good reading.

GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Faster production at lower cost

MODERN COLLAPSIBLE TAPS

New

FOR EITHER STATIONARY OR ROTARY USE

- Easy and quick adjustment. No special tools required.
- Interchangeable shank for convenience in changing from one machine to another.
- Thread length setting undisturbed by diametrical adjustment.
- Extra rigidity with unusually sensitive collapse.
- Simple in design. No complicated mechanisms.
- Heavy chasers for greater strength. Chaser threads precision ground.
- All parts hardened and ground and precision fitted.

Modern Precision Tools Include . . . . .

STATIONARY SELF-OPENING DIE HEADS
ROTARY SELF-OPENING DIE HEADS
STATIONARY COLLAPSIBLE TAPS
ROTARY COLLAPSIBLE TAPS
MODERN-MAGIC CHUCKS AND COLLETS
SELF-OPENING STUD SETTERS
INSERTED BLADE FACE MILLING CUTTERS
SOLID ADJUSTABLE DIE HEADS
ADJUSTABLE HOLLOW MILLING TOOLS
UNIVERSAL CHASER GRINDING FIXTURES

Send for full information on this new improved Modern Collapsible Top and its cost reducing possibilities applicable to your tapping

MODERN TOOL WORKS

DIVISION OF
CONSOLIDATED MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

HOW TO OPERATE A PLANT PROFITABLY

Here's what noted manufacturers say...

"55% time saved. Increased production over 100%"....
Automatic Transportation Co.

"30% time saved—our first choice"....
Otis Engineering Corp.

"Turning time cut one-half"....
Link Belt Co.

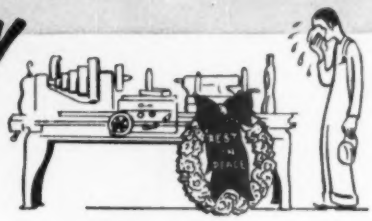
"50% time saved"....
Wyman-Gordon Co.

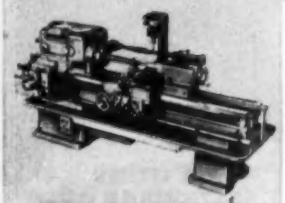
"Superior for lower tooling costs"....
Continental Motors Corp.

"Save 50%"....
Norris Stamping Co.

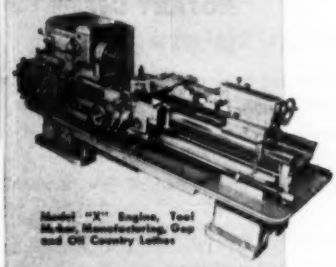
"The lathe is doing everything and more than we had hoped for".... 400% increase.
American Cast Iron Pipe Co.

It pays to replace with Lodge & Shipley Lathes!

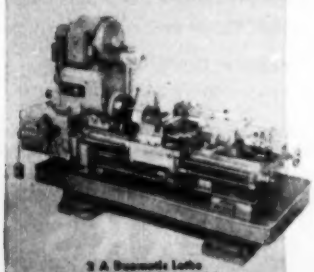




Copymatic Tracer Controlled Lathe



Model "X" Engine, Tool Maker, Manufacturing, Gap and Oil Country Lathes



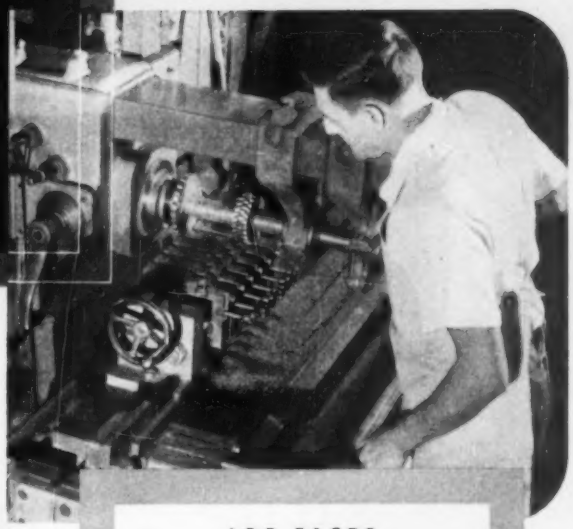
3 A Automatic Lathe (Multiple Tool Automatic)

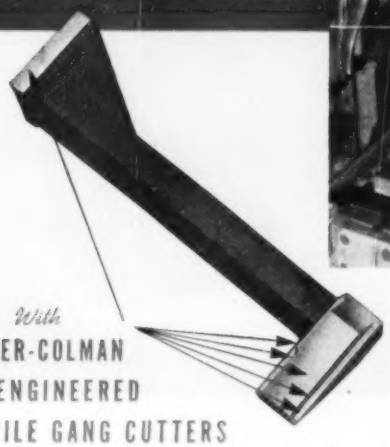
Lathes only a few years old may be badly outmoded. To compete on a profitable basis your lathes must be truly up to date. The versatility, accuracy and exceptional productive capacity of Lodge and Shipley Lathes are setting records for thousands of alert manufacturers.

The low cost, precision production of Lodge and Shipley lathes is a valuable weapon in the fight against mounting costs. Replace and modernize with Lodge and Shipley—you will be sure to obtain all the latest advantages for profitable production.

THE Lodge & Shipley COMPANY
MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

6 SURFACES ON PIECES IN 12 MINUTES





With
BARBER-COLMAN
JOB-ENGINEERED
PROFILE GANG CUTTERS

JOB FACTS

Operation — Gang Mill 6 Surfaces in 1 pass
Material — Cast Iron
Cutters — B-C Job-Engineered Profile Gang Cutters
Production — 30 pieces per hour, floor-to-floor
Feed — 3"/min. Speed — 100 RPM
Tool Life — 1000 pieces per gang sharpening

Simple arithmetic shows this to be milling cutter efficiency. There is no need for taking 6 cuts in one piece, or one cut in 6 pieces, when it can be done just as easily all in one pass with job-engineered Barber-Colman Gang Cutters. In this case, it takes only 12 minutes to do the job complete . . . *or two minutes each.*

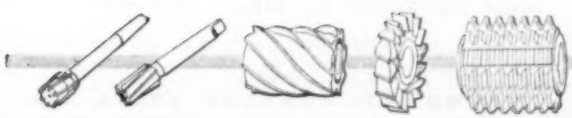
On-the-job efficiency for many milling operations is built into cutter design by Barber-Colman cutter engineers. Their experience with a multitude of job conditions has provided the answer to rising costs and lower productivity on many production milling jobs. Get this same efficiency for *your* production problems. Call a Barber-Colman engineer for recommendations.

FREE

Get this complete catalog of Standard and Special Milling Cutters and Reamers. Write for File No. 8152.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 8151 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.



BARBER COLMAN

ARISTOCRAT OF WORK BENCHES

. . . built for men accustomed to the finest tools and equipment

We "pulled out all the stops" when we designed the HALLOWELL Cabinet Bench, giving it more "custom" features than any other stock bench we know of. All-steel construction, choice of top materials, ample storage space, standardized units, interchangeable accessories, and trim good looks are just a few of its advantages.

Bulletin 702 tells the story. Write for your copy today!

Work Benches
Foreman's Desks
Tool Stands
Platform Trucks

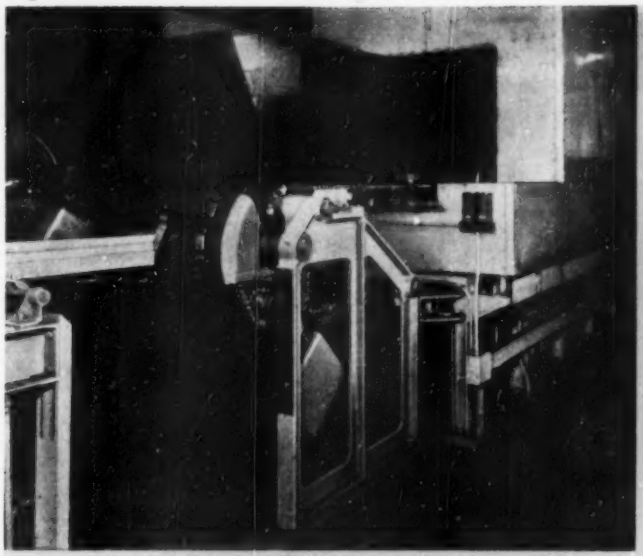
HALLOWELL

SHOP EQUIPMENT OF STEEL

Posture Stools
Posture Chairs
Cabinets
Folding Tables

SPS STANDARD PRESSED STEEL CO.

JENKINTOWN 7, PENNSYLVANIA

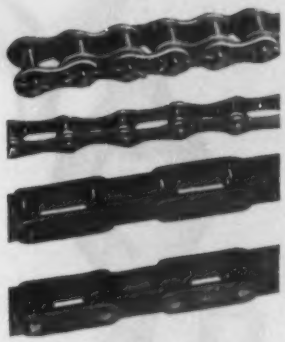


Lithographed metal sheets travel 13 feet per minute through 80 foot oven on twin strands of Link-Belt Precision Steel Roller Chain. High temperature conditions require accurate timing, which is assured by the constant-speed, positive travel, provided by Link-Belt precision made Chain and Sprockets.

neither heat, cold nor moisture can stall LINK-BELT driven RPM

There is a positive, unvarying relationship between the teeth of a Link-Belt Sprocket Wheel and Link-Belt Precision Steel Roller Chain. Neither moisture nor temperature conditions can cause it to slip or lose ratio. For corrosive conditions, chains and sprockets are made of bronze and stainless steel.

May we suggest that you discuss your drive and conveying problems with a Link-Belt engineer. His broad experience in the application of roller chain and sprockets may help you.



Typical Link-Belt Precision Steel Roller Chains for Conveying and Power Transmission.

Link-Belt cut-tooth Sprockets, accurately made to fit chain, assure longest chain and sprocket life.

LINK-BELT
PRECISION STEEL
ROLLER CHAINS
AND SPROCKETS

THE SYMBOL OF QUALITY — LINK-BELT — LB

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices, Factory Branch Stores and Distributors in Principal Cities.

ARMSTRONG

Quality TOOLS

NOT A COST, BUT AN INVESTMENT

That Pays Year After Year. . .

Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's job and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter-bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds, and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG Lathe and Milling Machine Dogs are permanent tools too. They are drop-forged from special open hearth steel, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.

ARMSTRONG Quality pays back over and over again. *Write for new S-48 catalog.* It offers many opportunities to conserve profits.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.

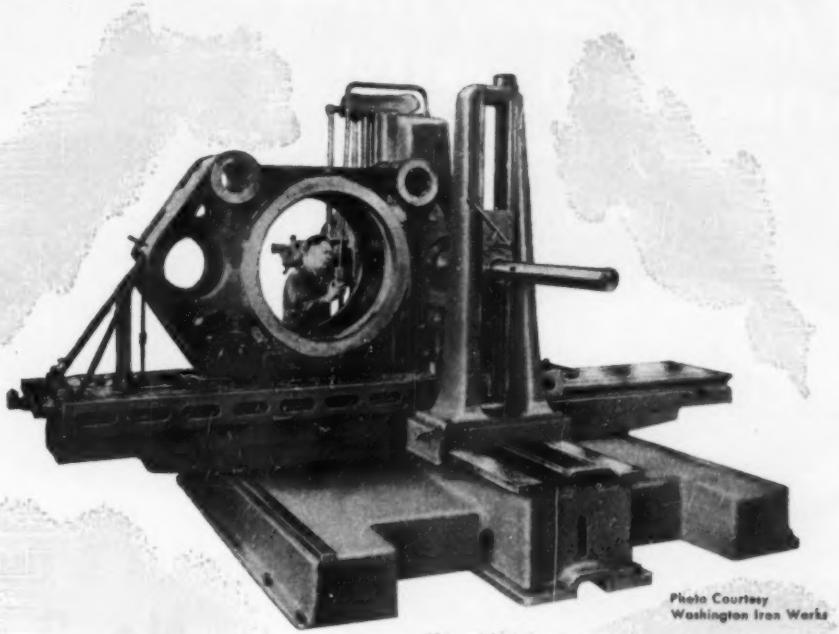


Photo Courtesy
Washington Iron Works

"THIS LUCAS CUTS COSTS IN HALF," says the owner

New Series 542 B-120, 4-way bed, Lucas shown here set up to line bore a 5 ton steel casting. Extra wide 120" bed permits long table cross travel. Outer ways are cast integral with bed.

In the plant of Washington Iron Works, Seattle, Washington, working on pieces up to ten tons, "Production time was improved 59% on one typical operation — 40% on another, compared with previous methods using other modern machine tools," to use the customer's own words.

Whether your work is large or small, single pieces or production operation, there's a Lucas size and type for your needs. Write for literature.

LUCAS OF CLEVELAND

LUCAS

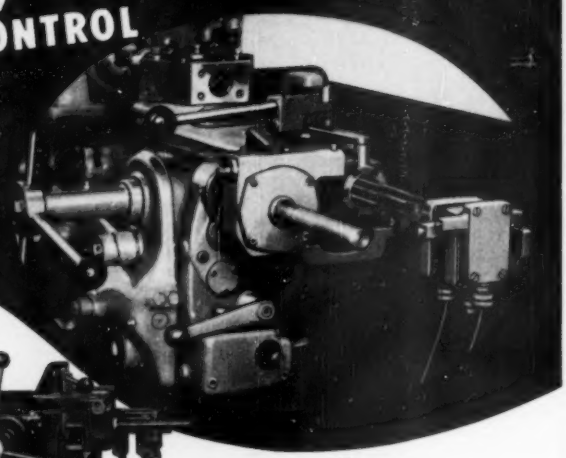
Precision

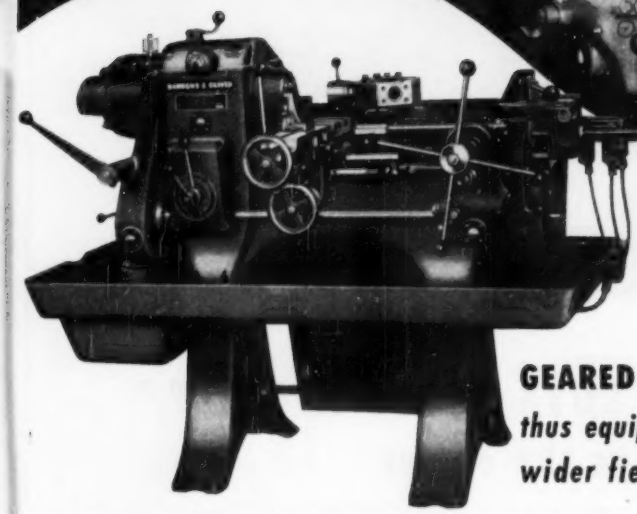
HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO

NOW AVAILABLE!

A Turret Leading Attachment and ELECTRIC REMOTE CONTROL

on a one inch capacity turret lathe





the Bardons & Oliver No. 2

GEARED ELECTRIC TURRET LATHE

thus equipped opens up a new and still wider field for this versatile machine

• In several prominent manufacturing establishments (names on request), a high degree of accuracy of thread is obtained by this new leading attachment. A conveniently located lever engages the double half nut with the leader. The forward motion of the slide is stopped either automatically by the turret stop screw or manually by the lever.

For tapping, the spindle is reversed automatically by the forward slide movement when the tap reaches full depth. The direction of the spindle rotation is changed again at the end of the rearward slide stroke.

An electric spindle speed change automatically reduces the spindle speed for threading and reaming.

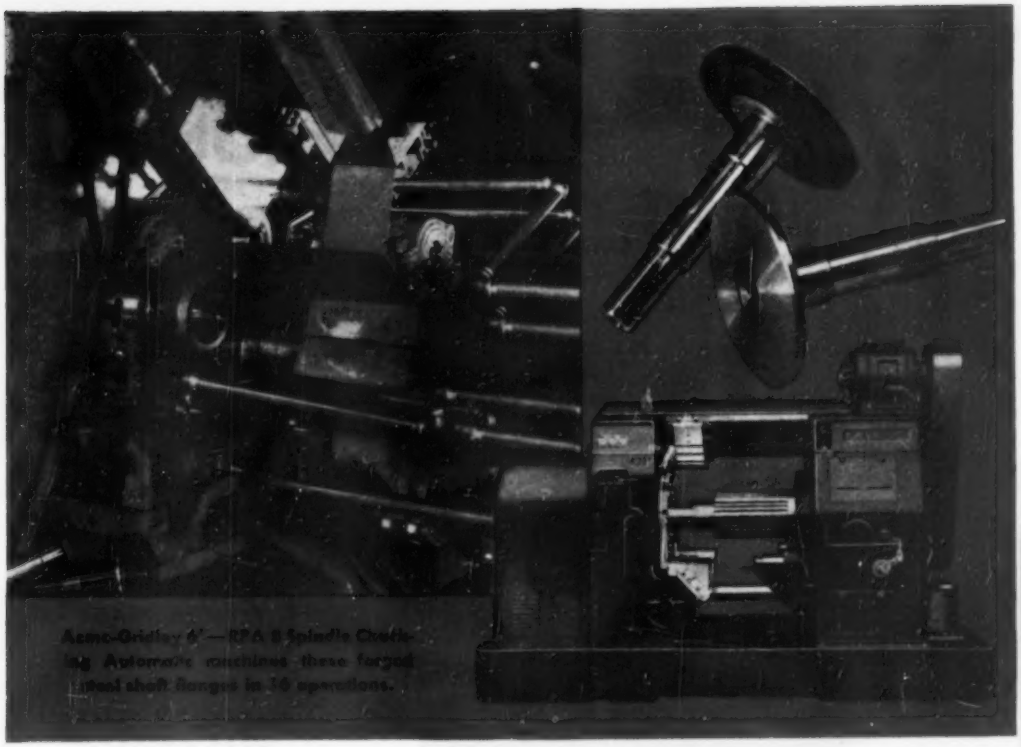
THESE FEATURES MEAN A LARGER NUMBER OF PIECES PER HOUR, A HIGHER QUALITY OF WORK, AND GREATER OPERATOR EASE.

The savings effected by this machine are often sufficient to pay for the entire new machine investment in three years or less.

Manufacturers of Turret Lathes and Cutoff Machines

BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO



Acme-Gridley 6'—RPA 8 Spindle Chucking Automatic machines these forged steel shaft flanges in 16 operations.

ACME-GRIDLEY outperforms other automatic 30%

The flange on this forged steel shaft is completely machined—16 operations—in 22 seconds. That's Acme-Gridley *performance*—30% faster than on the modern competitive multiple spindle automatic it replaced.

The reasons for such performance (and this is by no means an isolated or unusual case) are inherent in the basic design features of the Acme-Gridley. Timesaving carbide-tipped tooling is provided for in the rugged, rigid frame construction; direct and positive camming result in sustained accuracy at high speeds—as fast as modern tools can take. And the machine's adaptability for a wide variety of tooling (including independent power-driven auxiliaries where desirable) permits an economical distribution of cuts to reduce total machining time.

These and many other features are built into every Acme-Gridley Automatic, to give you "more good pieces in the pan at the end of the day." For more complete details on Acme-Gridley 4, 6 and 8 Spindle Chucking Automatics, ask for Bulletin CM-43.

JOB-FACTS

PART—Forged Steel Shaft Flange (shank and spline previously machined)

MATERIAL—.40 Carbon Steel

OPERATIONS—16

TOOLING—Carbide Insert (except drills)

MACHINING SPEED—more than 500 s.f.m.

DRIVE—through Collet Chuck and Spline

MACHINE—Acme-Gridley 6'—RPA 8 Spindle Chucking Automatic

MACHINE TIME—22 Seconds (164/hr.)

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

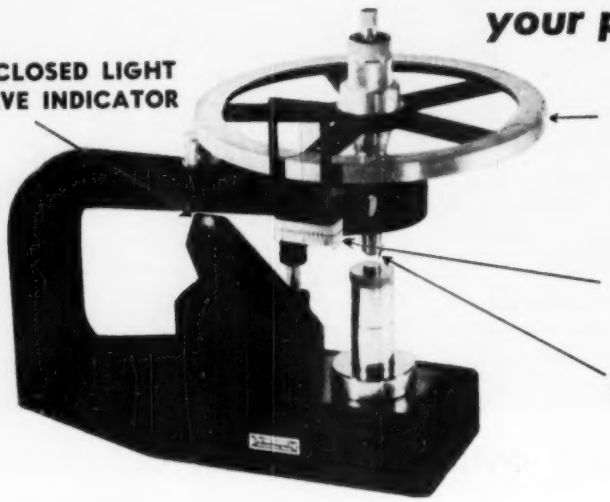
Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids • Centrifuges • Contract Manufacturing

THE NEW

Van Keuren

0 to 3" LIGHT WAVE MICROMETER

will improve your product . . .



CATALOG AND HANDBOOK No. 34

This 208-page volume represents 2 years research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request. ●

THE Van Keuren Light Wave Micrometer is an instrument of exceptional merit, proven over a period of 15 years. It has enabled hundreds of High School boys and girls to produce and inspect parts to "Hundred Thousandths" of an inch.

The New 0 to 3" Light Wave Micrometer has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non parallax, vernier index which enables readings to be made to .00001". It has an index lock. It has carboloy tipped anvil and spindle. It is a sturdy, yet sensitive instrument which weighs 17 pounds. It is a portable measuring machine, built for "Sustained Accuracy."

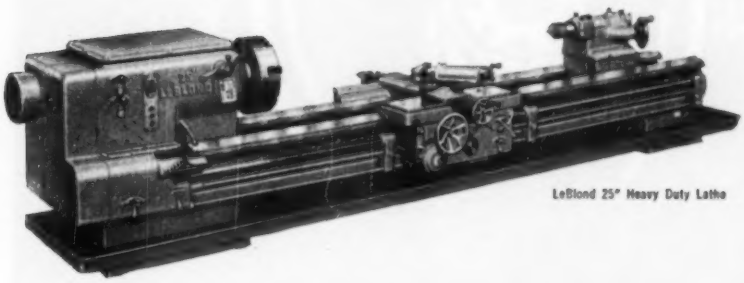
The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision—fast, accurate and profitable.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

31st YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

we mesh fewer gears to give you greater power on...



LeBlond 25" Heavy Duty Lathe

12"
14"
16"
20"
25"
32"

LEBLOND HEAVY DUTY LATHES

No-load Friction HP
20" Heavy Duty Lathe
(20 HP Motor Standard)

LOW RANGE		HIGH RANGE	
Spindle RPM	Friction HP	Spindle RPM	Friction HP
9	.56	18	.75
12	.60	23	.83
16	.64	31	.94
20	.71	39	1.09
26	.49	50	.75
34	.53	66	.83
44	.60	85	1.01
57	.71	110	1.24
71	.68	137	.94
92	.64	178	1.16
119	.71	230	1.50
154	1.05	297	1.91
191	.98	369	1.80
248	1.24	480	2.40
321	1.61	620	3.15
415	2.02	800	4.13

The headstock design of LeBlond Heavy Duty Lathes incorporates the free-running principle, with hardened and ground steel gears.

Result? Fewer gears in mesh at any given spindle speed to minimize no-load friction horsepower. More *smooth* power for your production work. Longer life from your LeBlond Heavy Duty Lathe.

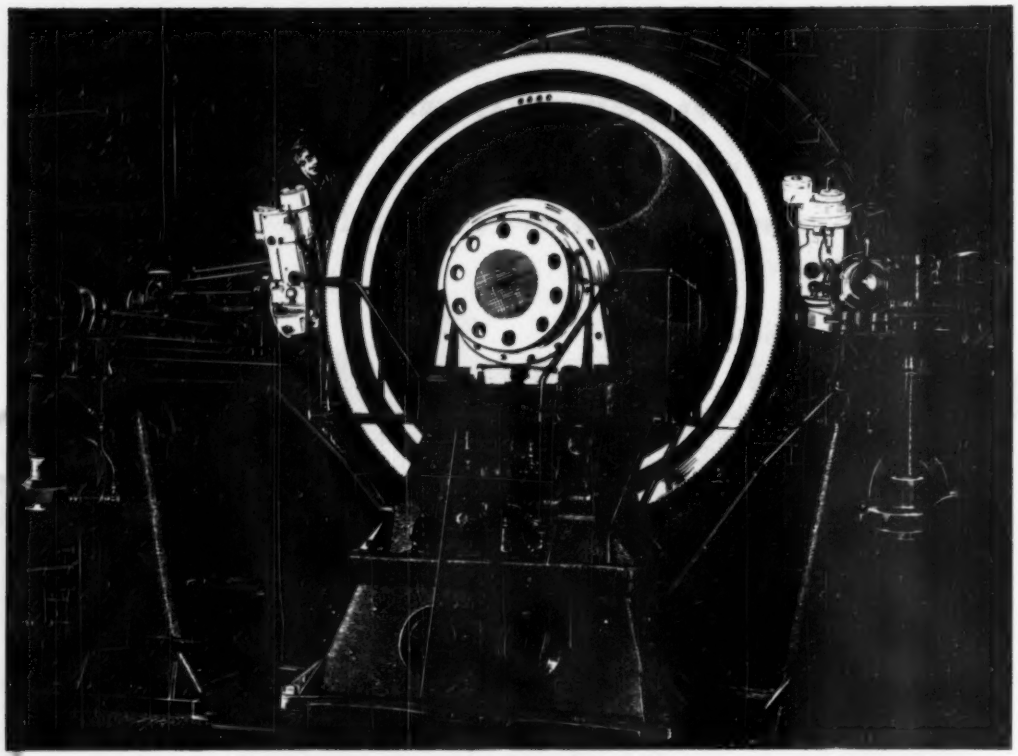
Sixty-three years of machine tool leadership stand behind LeBlond's complete line of 76 lathe models to give you day-in, day-out dependability. Your LeBlond distributor will tell you about our latest models. Call him or write—

THE R. K. LEBLOND MACHINE TOOL COMPANY
Cincinnati 8, Ohio.

NOTE: *LeBlond also builds huge 40" and 50" Heavy Duty Engine Lathes.*

LEBLOND
Heavy Duty

World's largest builder of a complete line of lathes.



THE MOST ACCURATE GEAR CUTTER IN THE WORLD IS PROTECTED BY CENTRIFUGED OIL

Down at the Trenton plant of the De Laval Steam Turbine Company is a giant 200-inch horizontal gear cutter, the most accurate one of its size in the world. Every drop of cutting oil, and every drop of lubricating oil, is continuously by-passed through separate De Laval Centrifugal Oil Purifiers to keep both oils scrupulously clean — free from every abrasive impurity, dirt or any condensate. It is just good common sense to protect large and valuable machines like this with a relatively inexpensive De Laval Oil Purifier.

The complete story on this interesting 200-inch gear hobber is in the current De Laval Centrifugal Review, Volume 16, No. 3. ***ASK FOR A COPY.***

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL PURIFIERS and CLARIFIERS FOR FACTORY OILS

for greater operating efficiency

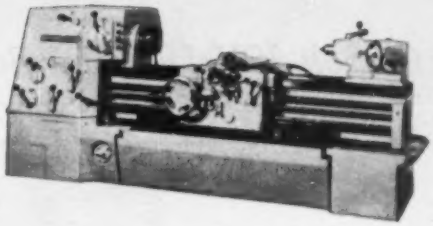
REPLACE With SPRINGFIELD

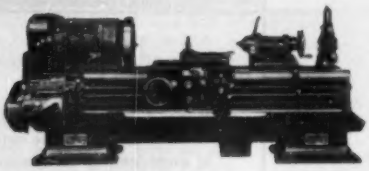
LATHES

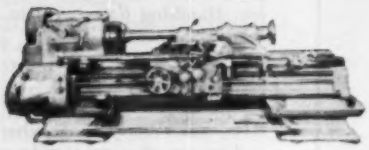
handle a wider range of work—

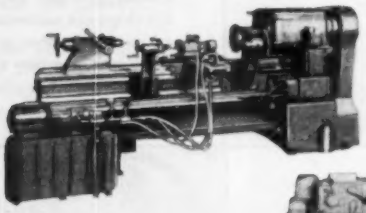
increase output—

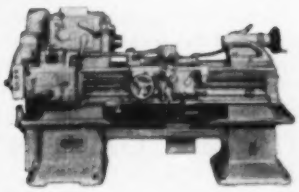
lower operating costs











TURNING
CONTOURING
PROFILING
ENGRAVING
REPRODUCING
BORING
THREAD CHASING
RELIEVING

14" to 32" sizes for heavy manufacturing operations or sensitive tool room work

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

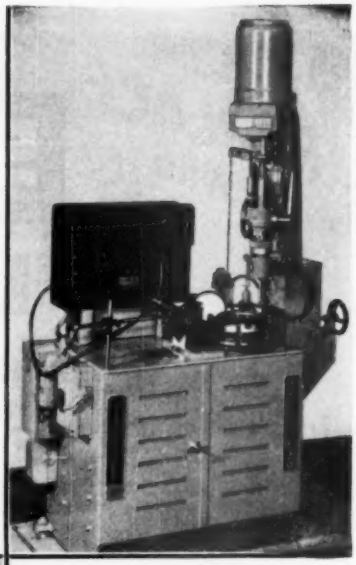
GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

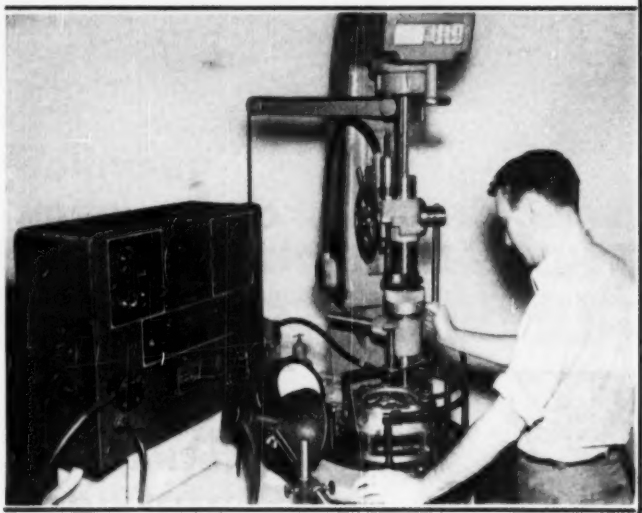
Exclusive Representatives in All Principal Cities

MACHINE BALANCES CLUTCH ASSEMBLIES!

Phenomenal speed and accuracy are achieved with the Gisholt machine which performs all four steps in the complete balancing operation as follows: (1) locates unbalance, (2) measures unbalance, (3) corrects unbalance, (4) checks balance. Designed especially for this work, the machine handles operations at the rate of 80 pieces per hour.

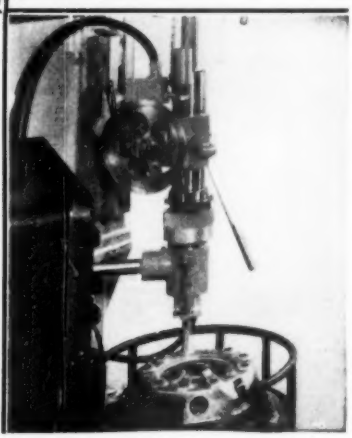
Gisholt ISV Dynetric Balancer





Saves handling time
With correction drill incorporated as a part of the machine, it is unnecessary to remove work piece from mounting for drilling. Handling time is cut to a minimum.

Corrections clearly indicated
Readings clearly show where and how much metal is to be removed in units of drill depth. All chips are automatically ejected so they cannot get caught in the clutch pressure springs.



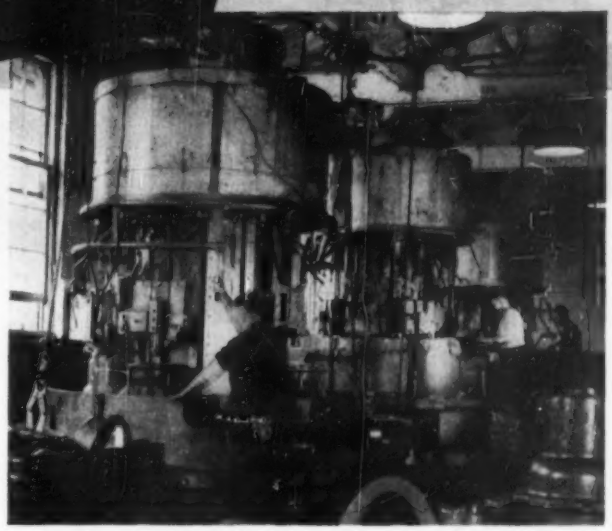
Insures better service Whether it's in production or repair work, the balancing of clutch plate assemblies is of little avail unless it is done *accurately*. And here, again, the DYNETRIC principle provides the accuracy which makes Gisholt the unquestioned leader in the field of balancing. Full information on request.

GISHOLT MACHINE COMPANY
Beautiful Madison, Wisconsin

DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

TURRET LATHES • AUTOMATIC LATHES
BALANCERS • SUPERFINISHERS • SPECIAL MACHINES

Convincing PROOF of MANUFACTURING ECONOMY



Management of Massey-Harris of Canada, are proud of their Low cost production and of the Bullard Mult-Au-Matic with which this has been achieved. Starting with one Mult-Au-Matic as a trial, they now have seven.

A statement from this customer reveals that specifically they have:

Cut total machining cost on all parts, in some instances by as much as 90%.

Eliminated costly material handling.

Made possible turning out a much more uniform product.

In one case the Mult-Au-Matic has paid for itself in 14 months.

One job shows 6½ pieces per hour against the previous 1½ pieces.

Another job shows 72% savings while still a third showed 86½% savings.

This case study proves the value of Replacing Economically Dead Equipment.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

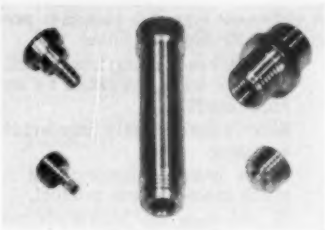
44% faster

That's the MONARCH SPEEDI-MATIC'S Production Increase on These 5 BRASS JOBS

Savings like these are typical of the Speedi-Matic's performance in plant after plant. But faster production is only part of the story. Here are some of the features that have contributed to the Speedi-Matic's phenomenal acceptance for all types of hand screw machine work up to 7/8" collet chuck capacity:

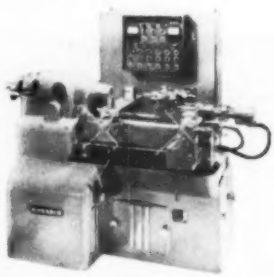
1. **ELECTRONIC CONTROLS**—permit presetting a wide, infinite range of speeds and feeds (nine speed stations, six feed stations) for maximum efficiency and fine finish.
2. **COMPLETE RANGE OF SPINDLE SPEEDS**—40 to 4,000 rpm insure selection of the one best exact speed for every material, every diameter.
3. **SIMPLIFIED SET-UP**—makes the use of Speedi-Matic profitable even on the smallest lots, as well as for larger quantities, up to 3,000 and more.

No other machine offers a comparable combination of design features for "*peak production at a profit*". For the tops in economy, accuracy and speed, it's the "World's Fastest Hand Screw Machine" every time. Be sure you have our complete catalog on the Speedi-Matic—ask for Bulletin 1903.



JOB FACTS

Parts—Five Hand-Screw Machine Jobs
Material—Brass
Spindle Speed Range Used—200 to 3,500 RPM
Lot Sizes—500 to 3,000 pieces
Machine—Monarch Speedi-Matic
Production Increase—24 to 56% (average 44%)



ACCURACY · ECONOMY · LONG LIFE
Monarch TURNING MACHINES

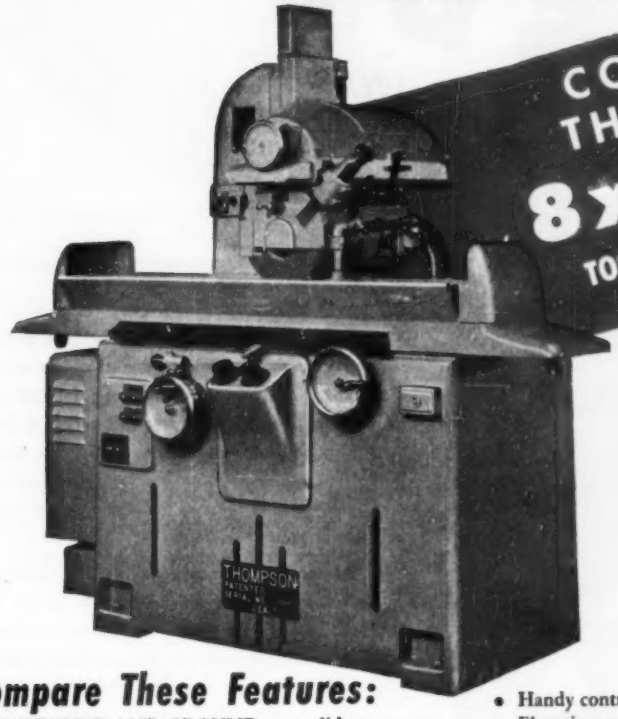
THE MONARCH MACHINE TOOL CO., Sidney, Ohio

FOR A GOOD TURN *FASTER* —— TURN TO MONARCH

Announcing The New Thompson Type 2F

SUPER PRECISION

Tool Room Grinder

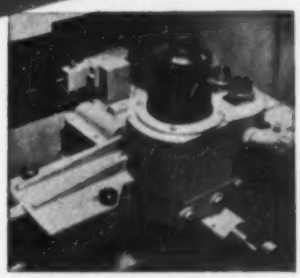


COMPARE THIS NEW

8x10x24

TOOL ROOM GRINDER

(Write for specifications)



MAGNIFIED TEMPLATE DIAMOND WHEEL DRESSER with ten to one magnification available in universal manually operated and electric. Other auxiliary Thompson Type 2F equipment includes "Coolant Thru the Wheel" feature and Magnetic Chucks with control.

Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.
- Handy control panel.
- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry

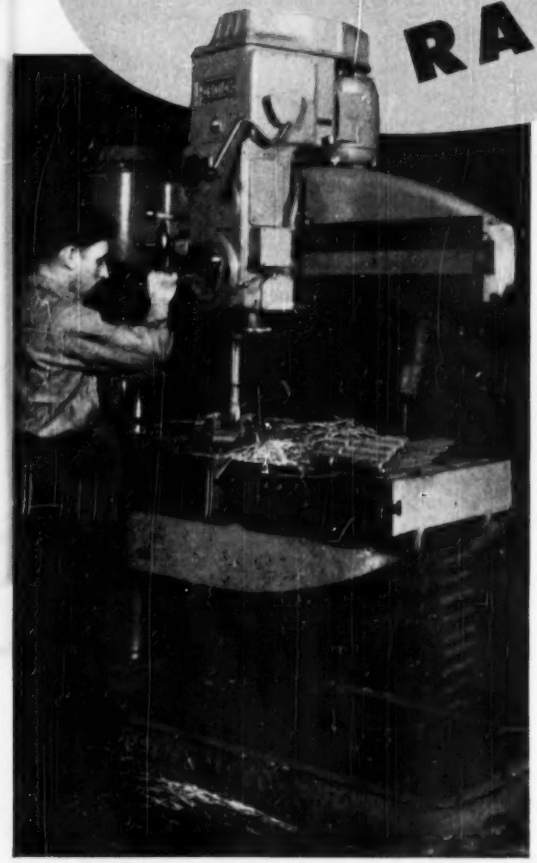
Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

Copyright 1950—The Thompson Grinder Co.

For Sensitive Drilling up to 1½" diameter—use a

FOSDICK Sensitive RADIAL



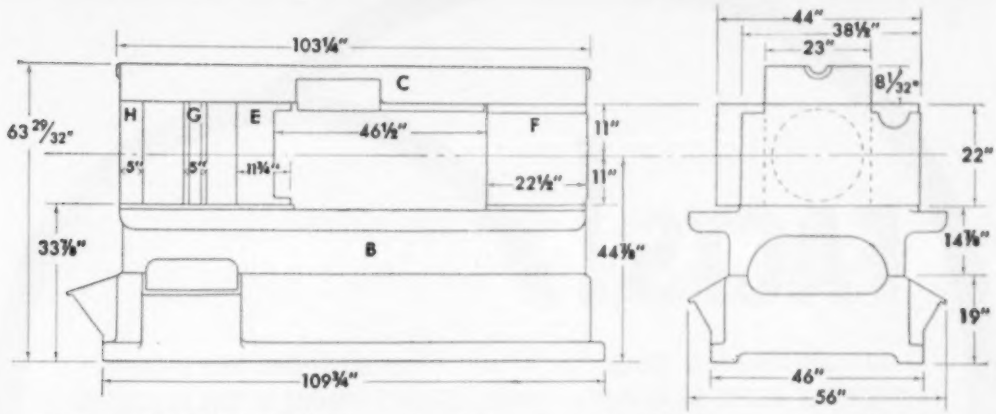
● Your first saving with a Fosdick Sensitive Radial begins at the point of sale as the initial investment is moderate. From then on its many economies are the result of its wide application to sensitive drilling operations and the ease of control and operation. In this new machine you get the sturdy construction and rigidity of a radial plus the high speed characteristics of a sensitive.

Note the installation shown—the work is mounted on an adjustable table which swings in an arc of 360°. You can always locate the table in the correct position for the job at hand. The arm is at a fixed height and also swings in an arc of 360°.

All controls, being centralized on the head, are always within easy reach of the operator from his normal working position. The machine has nine spindle speeds and four spindle speeds and four spindle feeds, fast traverse to the head, table that may be moved by hand or power, a tool ejector and a new patented semi-automatic tapping control.

For all around utility you can't beat this new Fosdick Sensitive Radial. Complete details of construction and operation are available in the Fosdick Sensitive Radial Bulletin S. R. A. Write for yours.

FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO



H, G, E — HEADSTOCK SUPPORTS Weight — 1233 lbs.

B — BASE Weight — 6655 lbs.

C — TOP BED Weight — 1232 lbs.

F — GEAR BOX Weight — 841 lbs.

BE VALUE WISE OR OTHERWISE

True of any "means goods," the purchase price of any Multiple Spindle Bar Automatic is only relative. It is "high" or "low" on the basis of the total cost of its total services, compared to other brands. Important items of total cost are those of operation and maintenance.

Machine analysis will invariably disclose the low cost operation and maintenance features that have been "built into" a machine. Such features are built into the CONOMATIC, beginning with its very foundation. The figures above substantiate the claims below.

THE 1½" Six Spindle MACHINE FRAME:

1. **Provides greater capacity for handling work.**

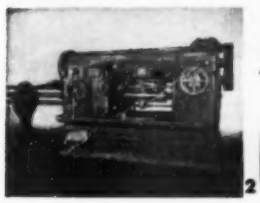
   The Frame provides a LONGER TOOLING AREA, with more positions and accommodations for tooling and attachment applications, with more clearance and conveniences for faster tool setting, than are provided by any other "automatic."

2. **Provides better support to work and tools.**

   The Frame provides better support and alignment to headstock members, tool slides, and other units and mechanisms, with BASE SUPPORT CLOSER TO THE WORK AXIS, with BETTER TOP BED SUPPORT TO SHORTER, "WEAVE PROOF," UPRIGHTS, and, with larger, heavier, and stronger, Top Bed and Base, than are provided by any other "automatic."

3. **Provides greater accessibility for lower cost operation and maintenance.**

   The Frame provides a more orderly arrangement of, and easier access to, all units, mechanisms, parts, and adjustments, than can possibly be provided by any "automatic" that does not have a VISIBLY ACCESSIBLE, NON-INTERFERING CAM SYSTEM.



Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

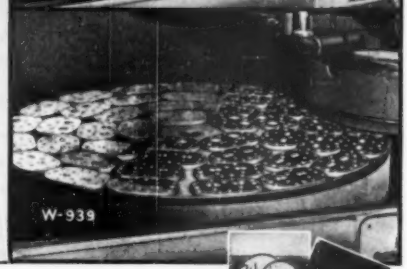
FACTS!

THE BLANCHARD WILL ROUGH GRIND LARGE QUANTITIES OF PARTS FASTER THAN OTHER MACHINES *and* **THE BLANCHARD WILL PRODUCE SURFACE FINISHES AS FINE AS ALLOWED BY THE PHYSICALS OF THE METAL ITSELF**

NO. 18 BLANCHARD SURFACE GRINDER

ROUGH GRINDING possibilities with a Blanchard is illustrated by these refrigerator valve plates. 1/16" of stock is removed from both sides of the rough cast iron parts. 44 pieces are ground per load at a rate of 80 pieces per hour (160 surfaces), to limits of ±.002" for size. A No. 18 Blanchard with a Blanchard 30C40 wheel is used.

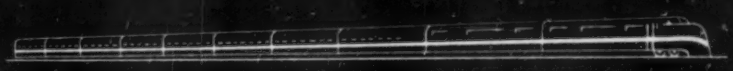
FINISH GRINDING these valve plates is done on the same Grinder. With 44 pieces on the chuck, a rate of 100 pieces per hour (200 surfaces) is obtained. .003" of stock is removed from each side to limits of ±.002" for size. Surface finish produced on the cast iron is *6 micro inches or better!* A Blanchard 100C15 wheel is used.



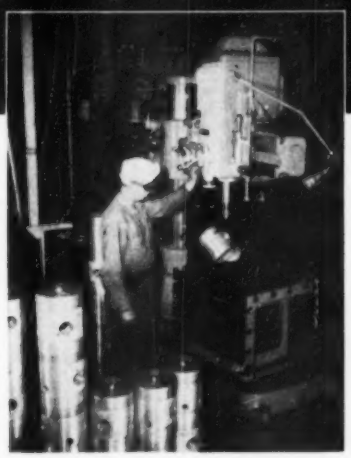
Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

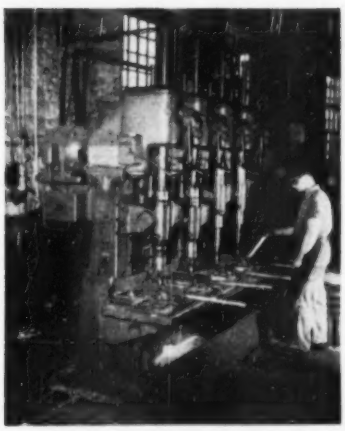
THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**



Important in the *Railroad Shop*



Drilling oil hole in aluminum piston.



Gang drilling a $\frac{1}{2}$" hole in mild steel push rod.

PHOTOS—COURTESY BURLINGTON R. R.

Versatile and speedy Cincinnati Bickford Super Service Radial and Upright Drills, using Hi-Speed tools ranging up to $1\frac{3}{16}$", are doing many jobs in railroad shops—such jobs as drilling brake levers, coupler draft keys, coupler yokes.

The handiness of these machines, their ample power for hogging out metal, clean performance and ease of operation are outstanding.

Write for . . .

Booklet R-21-B on 9" Diameter Column Super Service Radials; also Booklet U-25 on Super Service Upright Drills.

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 21½" arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals.
Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

CROSS UNIVERSAL GEAR MACHINES

for

- ROUNDING
- CHAMFERING
- POINTING
- BURRING

Cross Universal Gear Machines embody advanced engineering developments to obtain highest productivity and assure lowest possible operating costs.

They feature utmost flexibility for handling a wide variety of gears. Continuous cutting motion, exclusive with Cross, speeds production at top efficiency.

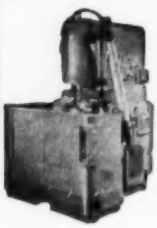
Special skill is not required because machines are automatic and push button controlled. Power clamping is foot pedal controlled. Both hands are free for work handling.

No. 55

For rounding, pointing, chamfering or burring external and internal:

spur gears
helical gears
clutches
splines

Typical productivity when rounding or pointing 8 pitch 30 tooth gears is 55 net hourly.



No. 65

For pointing or chamfering external and internal:

clutches
spur gears
bevel gears
splines

Typical productivity when pointing 10 pitch 30 tooth gears is 100 net hourly.

No. 75

For burring or chamfering both ends at the same time.

helical gears
spiral bevel pinions
hypoid pinions

Typical productivity when chamfering 8 pitch 40 tooth gears is 200 net hourly.

THE CROSS COMPANY
Established 1898

SPECIAL MACHINE TOOLS
MILLING • DRILLING • TAPPING • BORING
TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

We Blush

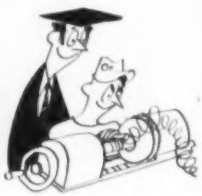
You are all to be congratulated on the fine job done in the "Disaster Control" issue of *American Machinist*. It reflects the very thinking that is badly needed today for intelligent planning by management.

The beauty of this issue is that it can be used by anyone in an executive capacity in approaching this vital problem. For example, I shall be calling attention to it in our Medical Section meeting on the Nov. 30 when we shall be discussing "Medical Planning for Disasters and Civil Defense."

A great deal of credit must go to you folks for having beaten everyone else to the gun with a real job. It was a privilege to have helped in our little way.

The reprint that Mr. Stocker showed me should be in great demand for obvious reasons.

S. A. Anthony, Jr.
Chairman, Civilian Protection Group
New York, N. Y.



School Shops Again

About one year ago I read a very interesting summary of a survey which you conducted in regard to the need and the present trend of shop courses in the curriculum of the major universities in the country. Since I have been asked to present a lecture December 5 on this subject, and since I am very much in favor of your thoughts on this matter, I would like to receive one or two copies of this survey if you still have them available.

You might be interested to know that in my position as an Associate Professor in shop courses, I have discussed the subject material of this survey with quite a few of our undergraduates and graduate engineers, and many of our students believe that the results of your survey are of the utmost importance.

Fulton Holtby
Supervisor
Materials and Processing Labs
University of Minnesota
Minneapolis, Minn.

Approximate Drawings

What causes me to write is a line under the heading, "Approximate Copy" (*AM* Oct 16, p 181). For some time it has seemed to me that in editing and illustrating Practical Ideas, some of this same approximation has been involved. Most of my criticism is directed toward the illustrations, which often cause me confusion due to slight changes which affect the working of the whole idea. So many times I have pondered the Practical Ideas sketches to try to understand their working and have finally found some small but vital error in the illustration which accounted for my difficulty in comprehension. I am sure that others have had the same trouble.

As an example, take my "Die Rubber Disks . . . ." contribution (*AM* July 24, p 141). The leader from "rubber" points to a steel plate. More important, my note about welding the inner steel disk to the center bar was omitted. This would cause readers to doubt the design, for it would

Eliminate COSTLY SET-UPS!

External grinding spindle on double-end universal wheelhead.

FEATURES of a Truly Universal Grinder

1— Internal spindles for small, large and deep hole grinding — speeds from 6,000 to 35,000 R.P.M. All flange mounted, sealed from grit, life lubricated.

2— External spindle has double-row roller bearings for radial load and ball bearings for end thrust — maximum rigidity with no adjustment needed. Lubricated for life.

3— Lathe-type workhead spindle mounts draw-in collets and step chucks directly.

4— Micrometer table stop and fine feed for shoulder and blind hole grinding.

5— Sine bar sets workhead or table swivel for perfect tapers.

with RIVETT'S TRULY UNIVERSAL HYDRAULIC GRINDER

Set-up time, the largest cost item in tool room and small-lot grinding, is reduced to the barest minimum with the new 1024 Rivett— the modern grinder with the truly universal double-end wheelhead. Mounting both internal and external spindles and swiveling 180°, it handles both types of grinding with equal mastery—makes the change to either work in a matter of seconds. So many interesting features are designed into the new 1024 that you'd be well repaid by writing for Bulletin No. 1024A.

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For More Precision Work *RELY ON RIVETT LATHES AND GRINDERS*, The Master Craftsman's Master Tools

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CRI-DAN
SEMI-AUTOMATIC HIGH SPEED THREADING MACHINE
MATERIAL
HARDNESS
S.F.P.M.
STEP No. 1
Determine Surface Feet Per Minute by setting slide at Material being threaded.
STEP No. 2
With Step No. 1 Slide set at Surface Feet Per Minute, Step No. 2 indicates Number of Passes required for Threads Per Inch.
Cut right or left hand threads with equal speed
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how much faster the Cri-Dan Single Point Threading Machine will handle any single start thread profile up to 4" external—6" internal!

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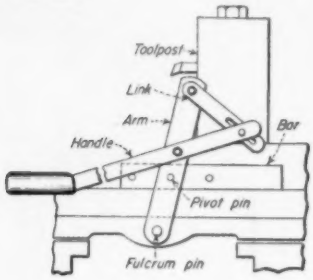
The LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

call for all the torque to be transmitted through the small area of grip of the rubber to the center bar.

A truly impossible sketch illustrates the contribution, "Toolpost Control Handle . . . ," by Ian J. Peacock (*AM* Oct. 16, p 169). I suspect that in his original drawing Mr. Peacock had a slot shown in the link engaging the cross-slide pin. As shown, you have this impossible situation.



The sliding member cannot follow a straight line and a circular path at the same time!

In this case, the sliding member can move, for the pin is free to move in the slot as the arm follows a radial motion.

Robert Roedder
Berwyn, Pa.

We can understand your problem when definite errors appear in drawings that should be accurate down to the last thin line. As avid readers of many technical and semi-technical magazines, our attitude toward mistakes that can mean confusion and wasted time is not too charitable; but on the other hand we understand the problem that any editor faces. Illustrators are not often shop men or technicians, so many errors crop up in the final drawings. Too, original sketches from contributors are sometimes incomplete and have minor errors. A good magazine staff will catch most of these, and on a percentage basis the batting average is extremely high. However, some slip past even the best proofreaders.

Just to keep the record straight, we checked and found Mr. Peacock's original sketch exactly as shown above. That leader, however, was definitely misplaced. By the way, is that shortened arm of yours a case of "Approximate Copy?"—Ed.

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ELMIRA, N.Y.

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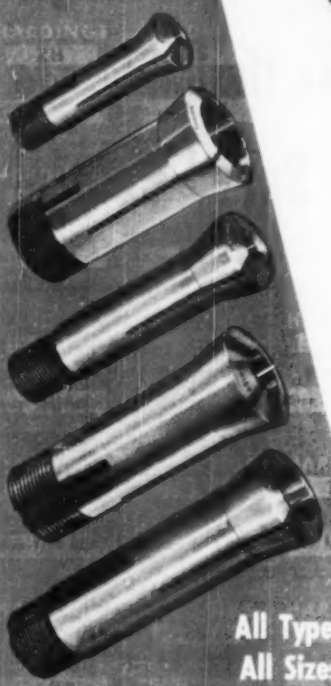
for

All Lathes and Millers



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Heat Treated Threads

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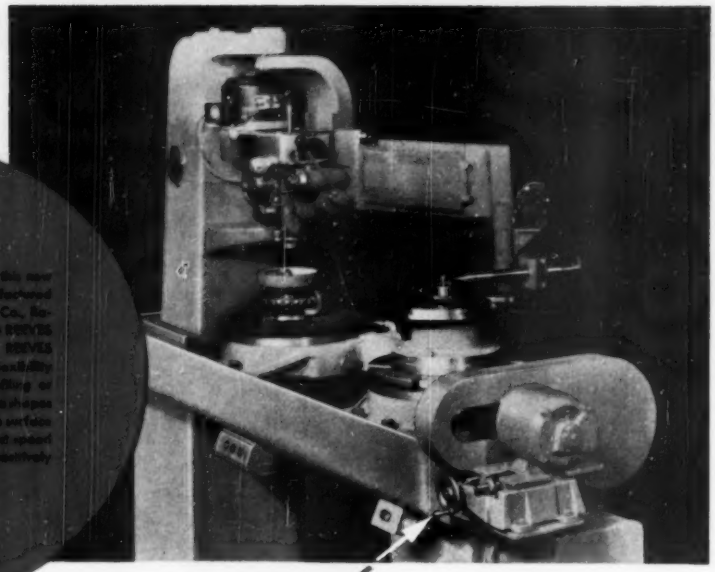

● The two 14" rotary tables of this new Cincinnati Milling Machine Co. Hydro-Tel Mill, No. CM-12, manufactured by the George Gorton Machine Co., Racine, Wis., are driven by a No. 20 REEVES Vari-Speed Motor Pulley. The REEVES drive provides unusual speed flexibility and versatility—essential to profiling or grooving different cams or cam-like shapes to very close tolerances, with high surface finishes. REEVES will assure instant speed changes—maintains any speed positively and accurately.

The sign of complete machine flexibility:

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Makes your machines—any machines—more versatile! more useful! more productive!

Your machines will take every change in material, product, process and operating condition in stride . . . turn out more kinds of work, better work and more profitable work . . . when equipped with accurate, positive, flexible REEVES Variable Speed Control. REEVES offers a complete line, including designs, sizes, capacities, speed ratios and controls for every specialized need. Install REEVES—proved in more than 260,000 installations—on machines now in service. Ask for it on the new machines you buy. Let a REEVES engineer examine your speed control problem—no obligation, of course. Send for complete, 132-page catalog No. A57-3N.

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The 3 basic REEVES units

VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over a wide range—2:1 to 16:1. Sizes—fractional to 87 hp.

VARI-SPEED MOTOR PULLEY provides an instantly variable speed drive within 4:1 ratio for any constant speed motor. Sizes to 10 hp.

MOTODRIVE combines motor, speed varying mechanism and reduction gears in a single unit. Speed variations 2:1 to 6:1 inclusive. Sizes up to 20 hp. (Also available in fractional hp sizes with speed variations to 10:1.)

Recognized leader in the specialized field of speed control engineering

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REEVES *Speed Control*

SPOT NEWS of Metalworking

- **Some of phantom orders for machine tools** may soon be activated, thus giving machine tool industry priority for materials and component parts. Marshall Smith, vice president E. W. Bliss Co., has become chief of Machinery Division, National Production Authority.

- **Sharper materials cutbacks and quicker use of bans on non-essential end products** will result from Charles E. Wilson's appointment as head of the new centralized production control agency in Washington. First job of new agency is staffing it with thousands of employees. Sheer lack of people alone means that total controls cannot come overnight.

- **Munitions factory in Holland to be operated by Hispano-Suiza** is likely to be approved shortly by Dutch government. Proposed plant will produce 20-mm guns and ammunition.

Valves for auto engines are being made by new "C" casting process (plastic shell mold castings) saving up to 70% machinery. Automatic transmission gears may be produced by this technique, thus cutting a high-cost item. Experimental crankshafts are being turned out from nodular iron, and will require only grinding of the journals.

- **Expansion of west German industry is expected in these directions:** (1) reconstruction of August Thyssen foundry, (2) rebuilding of Hermann Goering steel works, (3) resumption of manufacture of steel plate at Hoerde, (4) lifting of ban on domestic orders for shipbuilding, (5) easing of restrictions on machine tool production.

- **Thickness of chrome plating on certain automobile parts has been reduced** for 1951 as result of shortages. One company is reported using only one-fifth the normal thickness. Trim and probably many zinc die castings probably will disappear from cars as 1951 progresses.

- **A new continuous melting process for titanium** is likely to increase output and lower costs of that material. Ten-inch ingots will be produced by the new process. Molybdenum is being made in 7-inch ingots by similar method. Sintered pellets are dropped into an arc between the melt and walls of the furnace tube. Melting is in atmosphere of argon gas. Melt drops by gravity into water-cooled section of furnace and emerges as continuous billet.

- **Government is considering plan to build 200 fast cargo ships** to outrun snorkel-type submarines. Ships would be similar to 16 ships to be built with $126 million requested by Maritime Board.

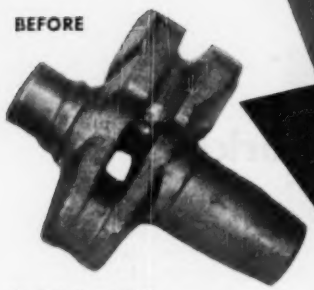
Aluminum jeeps, trucks and 106-mm guns to be used as airborne equipment are in planning stage, Richard S. Reynolds, Jr., president Reynolds Metals Co., told American Management Association's Production Conference on Dec. 11 in Chicago. Prototypes of most military equipment have been made in aluminum.

- **What it takes to get finished steel these days:** one consumer bought ingots in Ohio, shipped them to Maryland to be rolled into hot sheets, then sent them to Connecticut to be cold rolled. Final delivery was made to the consumer's plant 60 miles from Connecticut mill.

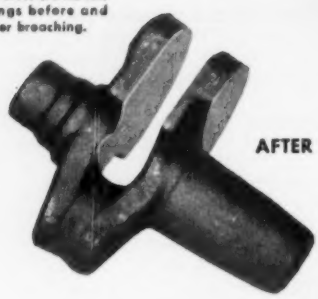
- **New liquid material which penetrates very small cracks before hardening** has been developed by General Electric Research Laboratory. Known as "anaerobic permafil," material solidifies quickly away from air. When two metal strips are coated lightly with it and clamped together joint will support 10 lb after 10 min. Possible applications: (1) eliminate lock nut needed to hold another nut tightly on bolt; (2) seal threaded joints in pipes; (3) make castings airtight.

- **National emergency (NE) steels are being substituted** for standard high-speed tool steels and special alloy steels by increasing number of companies as critical alloys become harder to get. NE steels were used extensively during World War II.

BEFORE



Small steel crankshaft forgings before and after broaching.



AFTER

A WINNING COMBINATION:

BROACHES AND FIXTURE BY CONTINENTAL

CTW

CUT 2-5/16" DEEP AT RATE OF 56 PIECES PER HOUR

Four sets of broaches and a four-station indexing fixture, both designed and manufactured by Continental, work together to broach crankshaft forgings at a rate of 56 pieces per hour. Eight broaching passes are taken on the small steel forgings to cut to a total depth of 2⁵⁄₁₆ inches.

Each set of broaches cuts one deep slot and both outer sides of the counterbalancing members of the crankshaft. Cam locks operated by individual hand levers hold the parts in the fixture. The fixture is designed so that it must be fully retracted to the start position before the parts can be removed; thus new parts cannot be located until the fixture is in position for the first cut.

This is a typical example of how broaches and fixtures by Continental can add new efficiency to your operations. For full information contact your local representative, or write Continental in Detroit.

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Division of Ex-Cell-O Corporation

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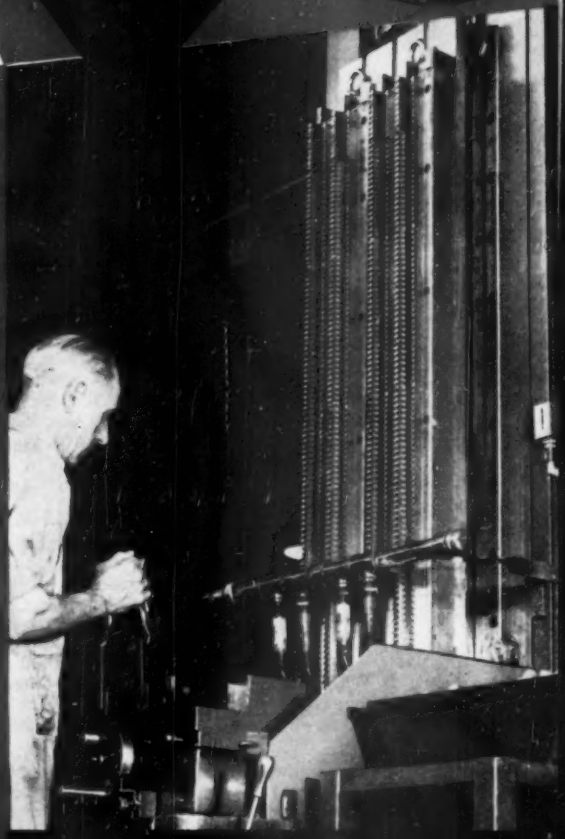

Above: Vertical surface broaching machine with four sets of broaches and a four-station indexing fixture. Eight broaching passes are required to cut to a total depth of 2⁵⁄₁₆ inches. Fixture is indexed after each pass by means of a hand wheel.

Washington

Lack of any strong leadership in Washington continues to limit the administration's effectiveness in both domestic and world affairs.

There is doubt everywhere, both here and abroad, as to what our intentions are. And, there is little confidence that any decisions finally reached can be counted on to stick for more than a few weeks, much less from one session of Congress to the next.

• • •

U.S. foreign policies, especially in the Far East, are still being compromised by the dictates of partisan politics.

President Truman's failure either to back Acheson to the hilt, or to fire him outright means no theory on how to lick communism is getting a fair trial.

At home, efforts to plan for the future—and, immediately, to mobilize—are confused by Washington's apparent inability to make any decisions capable of outlasting the hysteria of each new crisis that comes along. That's a common Washington complaint nowaways.

Even a new national emergency proclamation won't commit us to single set of long range plans. Its effect is mostly psychological.

This is especially true when you realize that both the limited emergency of 1939 and all-out declaration of 1941 are still, technically, in effect.

• • •

The indecision that's plaguing Washington is reaping its toll in the Pentagon where no single program for building up the nation's defenses has been able to survive for more than a couple of months. The present $16.8-billion second supplemental defense appropriation about to be passed by Congress is only an interim figure.

Even after it was certain the Chinese Reds had been committed full-force to the Korean fighting there was no top level decision on what it meant or on just what we should do about it.

• • •

More money for defense—a third supplemental—this fiscal year is certain, probably early in January after the 82nd Congress convenes.

How much more will be asked then still hasn't been determined. "Feasibility tests" are being run on a whole series of figures ranging from $2 billion to $15 billion.

Object is to find out two things: First, how much mobilization will we get for each of the various figures; second, how big a bite will each take out of the civilian economy.

The Joint Chiefs of Staff want the bigger figure. To them it means preparing for war. Their theory is that it's better to have too much than to run the risk of being caught short.

Others in authority are urging caution. There's as much danger—to western economies, morale, and long-range military strength—in being forced to demobilize too soon as there is in taking the chance that we'll find ourselves in total war without being fully prepared for it.

Actually there'll be no final decision even when the size of the third supplemental is finally fixed. The rate of spending is the real key to the speed and extent of our military build-up. It's also the measure of impact on our economy.

Within broad limits it can be changed up or down almost at will. But, the Pentagon is still saying we can't spend more than $18 billion on defense this year, nor more than $30 billion in fiscal 1952. Only all-out mobilization for war could extend these limits.

• • •

Immediately, any decision the administration arrives at will be for more mobilization, not less.

This requires better coordination of controls. Last week's decision to set up a single over-all defense production administration was inevitable, though it came sooner than anyone expected.

It goes right along with any efforts to establish across-the-board price and wage controls as well as a Controlled Materials Plan. CMP means, ultimately, international control and government bulk buying of most imported essential raw materials.

Total controls will take time to set up. Meanwhile, count on more spot controls, on prices as well as materials allocations, to come out.

On wages and prices, over-all controls are being readied for next spring, after fifth-round wage increases have run their course.

It's pretty certain there'll be no rollback of wages accompanying the freeze.

• • •

Wage Stabilization Board still can't decide what to do about cost-living escalator clauses in union contracts.

If the Consumers Price Index could be held down, there would be no problem.

Actually, the BLS index is due to rise sharply during the winter. It means more than a million workers will get wage increases under the General Motors-type escalator in March and will be due for more in June. Labor will fight hard to protect these increases.

• • •

Armed forces manpower goal is bound to be raised from the present 2.7 -million-man figure, perhaps up as high as 4-million men.

Later the political effects of keeping too many young men in the service for the three years a larger force will require may result in a cutback in the size of our defense forces.

BORES OF *Any Length* MAY BE MICROHONED*

remove stock efficiently, generate accuracy

This drawing shows a hydraulic cylinder 30 in. in diameter and 22 ft. long and the tool used to MICROHONE it. This cylinder is held to a .001 in. tolerance for straight and round for its full length.

*MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

MICROHONING* is the only production, stock-removing process that can be used on any length bore without loss of accuracy. Bores from .006 in. to 40 ft. in length are being MICROHONED with MICROMATIC equipment.

MICROHONED accuracy is not dependent on rigid alignment of the quill. Cutting pressures are balanced and act radially from the center of the tool. The large contact area stabilizes the tool in the bore. Tool construction isolates the cutting edges from machine vibration, and permits tool to align itself. The long plane-like abrasive levels off surface waviness and generates a round, straight bore. Any amount of stock can be removed, and size held to close tolerances. Surface finish may be held to any degree of uniform roughness, and duplicated in every bore.

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Detroit

The pendulum-like state of demand for automobiles seems to be on the increase. Reasons: Reaction from the lull which set in after more stringent credit restrictions were set up, together with the turn to higher prices, plus growing realization that there will be fewer automobiles in 1951.

Demand is still far from the frenzied levels of last summer, of course, but it is far from moribund. With December manufacturing volume firing faultily—due to changeovers, sporadic materials shortages —the buildup of field stocks has slowed down a bit. Field inventories will be definitely heavy by February's end, but probably not sufficient by themselves to force manufacturing cutbacks.

• • •

Here are some sidelights behind the price advances, as reported by GM and Ford: Wage costs (at GM) have gone up 11.13% in the past year. Steel is up 7%. Aluminum, 11.8%. Copper, 32.4%. Zinc 68.5%.

Rubber is up 300%. That includes December boosts of 12% and 32% in synthetics, whose prices are government controlled. The auto companies made much of this when called to task by NPA for advancing quotations. If government did so and steel, with Washington approval, why not automobiles?

• • •

Company notes: Chrysler plans a big increase in West Coast assembly operations—an 800,000-ft addition is planned at Los Angeles, intended to raise capacity from 250 to 400 cars a day. Completion will be late in 1951, if building supplies hold up.

Bendix Aviation has bought a 154,000-ft plant at Davenport, Iowa, from Victor Animatograph Corp., will use it to increase aircraft instrument production. The reason is more military demand.

Standard Steel Spring Co., big armor plate processor in World War II, has reactivated Detroit operations linked up with Ordnance.

MacKinnon Industries, Ltd., GM subsidiary at St. Catharines, Ont., will build a malleable iron foundry and power plant on 130 acres of land near Thorold, Ont. Foundry capacity was extremely tight during World War II—maybe with larger defense programs ahead that is the reason MacKinnon (and many other companies, too) are strengthening their foundry facilities.

Buick's foundry is in for enlargement. A 170,000-ft addition is planned at Flint, for completion in May. Something unusual in the plans: A basement, reached by ramps for trucks and elevators for employes, containing showers and locker rooms. Castings capacity has lately been a bottleneck with Buick, whose production reached an unprecedented 550,000 units in 1950.

• • •

GM itself has moved to get more automotive steel in the future. It has made a deal with Jones & Laughlin to lend that company $28 million to enlarge the Otis Works at Cleveland. Of the 360,000 added tons to come out of the expansion, GM will be guaranteed a reported two-thirds. GM didn't get into the steel business like many other auto producers at the end of World War II; it began to wish it had during the past year when operations were held down by metal shortages.

• • •

Machine tool and die companies in the Detroit area are still loaded up with civilian work, but they are getting wriggly. They fear some kind of halt, or cutback, on automotive work, and they have nothing to fill up any gap that might occur. Military business continues to be all but invisible at most points; the tool producers can't pin down orders for it.

• • •

Good first quarter production is anticipated. It will probably be off about 5% from 1950, yielding about 550,000 vehicles in January, 475,000 in February, and 575,000 in March.

Shortages will hurt civilian truck production as much as passenger cars. Copper is the primary problem, and there are no substitutes for copper radiator cores or wiring harnesses.

• • •

In place of aluminum for pistons, cast iron is being considered, despite an engine-counterweighting problem presented. One solution tried is a different type of engine mounting, using a rubber of different vibration and hysteresis characteristics, tending to balance out counterweighting deficiencies.

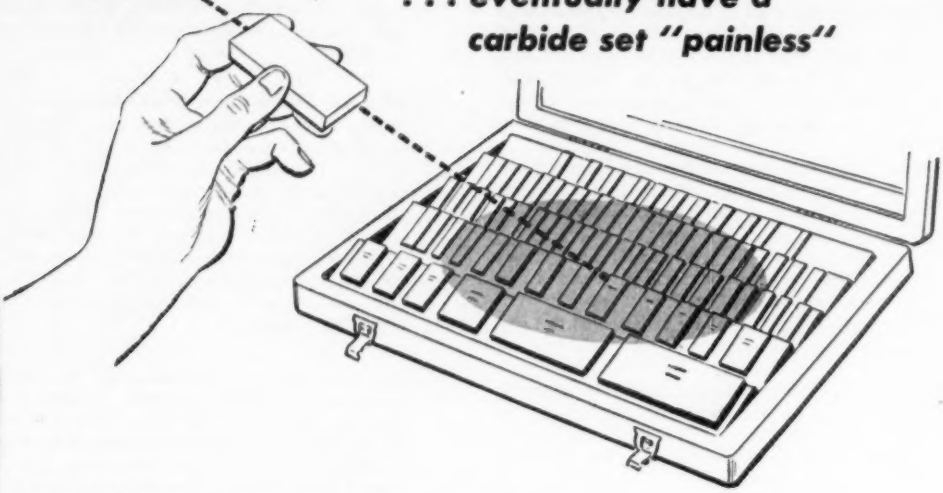
Nickel is being abandoned in many garnish moldings. Substitute is chrome on stainless steel. If chrome becomes tight then the stainless can be polished.

• • •

The engineering and production side continues to strengthen itself in direction of GM. When M. E. Coyle retires as executive vice-president on Jan. 1, his place will be filled by L. C. Goad (up from manufacturing). Moving into Goad's job will be John F. Gordon (engineering). A production man, Arnold Lenz, becomes head man at Pontiac, succeeding H. J. Klingler (up from sales) who advances to central staff. An engineer, Jack Wolfram, will head up Olds, succeeding S. E. Skinner, also an engineer, going up to central staff.

Replace worn blocks with CARBIDE

. . . eventually have a carbide set "painless"



A few blocks in every set are in constant use. They wear faster and are replaced at a faster rate than other blocks of the same set.

Replace them now with carbide Carblox and follow that policy on future replacements and your present set will be eventually converted to long-wearing carbide.

Here's the "painless" method to acquire Carblox, the blocks that outwear steel many times. No need for a special appropriation or a board session to approve the expenditure. Send your suspected blocks to us now with instructions to replace them. Or send us the entire set for inspection and recalibration. The prices of individual Carblox have been lowered substantially to make cost of such conversion easier to absorb.

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INSPECTION AND RECALIBRATION OF 84-BLOCK SET

Submit sets for periodic inspection to determine degree of wear. Sets will be returned with a Certificate of Inspection showing actual dimensions of each block and recommendations for replacement of those blocks worn beyond reasonable limits.

$15

NEW LOWER PRICES ON INDIVIDUAL CARBLOX

A growing volume of carbide replacement business has enabled Webber to effect economies in production of individual blocks which are being passed on to the user. If you do not have the June 1st price supplement on Carblox, write for your copy. Note: This new price reduction does not apply to the complete set—only to individual carbide blocks.

Webber
MICRO-ACCURATE GAGE BLOCKS and FIXTURES

Standard Steel Blocks
Carblox Carbide Blocks
Angle Blocks
Heavy-Duty Blocks, Fixtures
Special Size Blocks

Machine Tools

Phantom orders for machine tools are not likely to be activated in the immediate future. Their use is under discussion by NPA's Machinery Division, however. They would enable machine tool builders to get top priority for materials and components parts. Such priority has not been granted the industry up to now. Reason: not enough DO orders in relation to total bookings.

• • •

Main reason for phantom orders is to give machine tool builders so-called "pool orders" with which to get going in an emergency. This reason no longer exists, in eyes of many NPA people. Books of machine tool industry are crammed with orders for next year. But these orders still are mostly for non-defense work.

Fact is, though, that DO orders comprise a growing ratio of new machine tool business. If British orders are looked upon as defense orders, as they rightfully should be, some builders have rated orders equal to one-half their total backlogs.

• • •

Reports are ill-founded that all machine tool business is to be put on a preferential rating in the next month. It's true that the E-1-B program is under study by NPA. But it would take considerable time to set up machinery to handle any total priority system.

E-1-B or some substitute for it is likely to come in time. It will not be, however, within the next few weeks, as some reports have it.

• • •

Chances of wholesale cancellations of machine tool orders for new car models are slim. Automobile companies mostly will try to get these machines completed for these reasons: (1) machines then will be on hand when needed later; (2) prices are lower now than they are likely to be two or three years from now.

• • •

New machine tool orders in November stood at 282.2 on NMTBA index. That is a little under the October figure (290.5) and a little above September (280.6). Foreign orders were 9.6%. November shipments amounted to 109.5 on the index.

British have bought about 2550 machine tools out of a total of 3400 to be ordered in this country for their rearmament program. Deliveries are to be stretched over a long time. Some, including slotters, will begin in first quarter. Others won't be shipped until early 1952.

Wherever requested, British are making down payments on these U. S. orders. Eventually the British program will get DO ratings. But red tape in Defense Department and Munitions Board is said to be holding up action.

• • •

French have placed about $1 million of their U. S. tooling orders for armament production. Some U. S. builders want down payments from French, but cannot secure them as they are ECA financed (AMP program). British, on other hand, are paying for their machines themselves, and will be reimbursed later by Washington.

• • •

Marshall Smith is the newly-appointed director of the Machinery Division of NPA. He had been with E. W. Bliss Co. since 1945 as vice president, then president, and more recently vice president in charge of manufacturing in England and France and of export sales. He was associated with Worthington Pump & Machinery for 20 years.

Two consultants to Mr. Smith are Herbert L. Tigges, executive vice president, Baker Brothers, Inc.; and Edgar J. Seifreat, president, Seifreat-Elstad Machinery Co. Both are in Washington only part-time.

William Beck and Dewey Crim will continue in their offices with NPA's Machinery Division. They will assist Mr. Smith. Many of the details and contacts with production equipment builders will be handled, as they have been, by Joseph Fitzgerald.

• • •

Machinery Division may soon strip down mainly to metalworking machinery. Some of the products now being handled may be lopped off and put into another division.

Immediate objectives of Machinery Division are: (1) increased personnel, and (2) getting materials for machine builders.

• • •

No final action has yet been taken on seven applications for certificates of necessity by machine tool builders to expand their facilities. One is now in office of Frank Creedon of NPA, who recommends whether all or certain part of facilities can be written off in five years.

• • •

Critical situation of tungsten caused a meeting of the Industry Advisory Committee on Cutting Tools to be called by NPA on Dec. 19.

NEW DIRECTOR of NPA's Machinery Division is Marshall Smith, former E. W. Bliss executive.

SPECIFY STANDARDS FOR *Availability*

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Universal Use—can be used in lathes, boring mills and hundreds of single-point tool machining operations. Machine any metal or nonmetal; *unmatched performance on steel cutting.* Suitable for job lots or quantity production.

Low Cost—versatile Standard Carboloy Tools are comparable in price to many high-speed steel tools and in many sizes are actually cheaper. Mass-produced under rigid quality controls to give you the highest quality at low investment cost.

And you can add the advantages of simplified ordering, easy selection and versatile grades, plus the extra assurance that in the Carboloy brand of tools you get uniform quality in *every* tool . . . in *every* order . . . in *every* regrind.

Write today for price list and new Catalog GT 250.

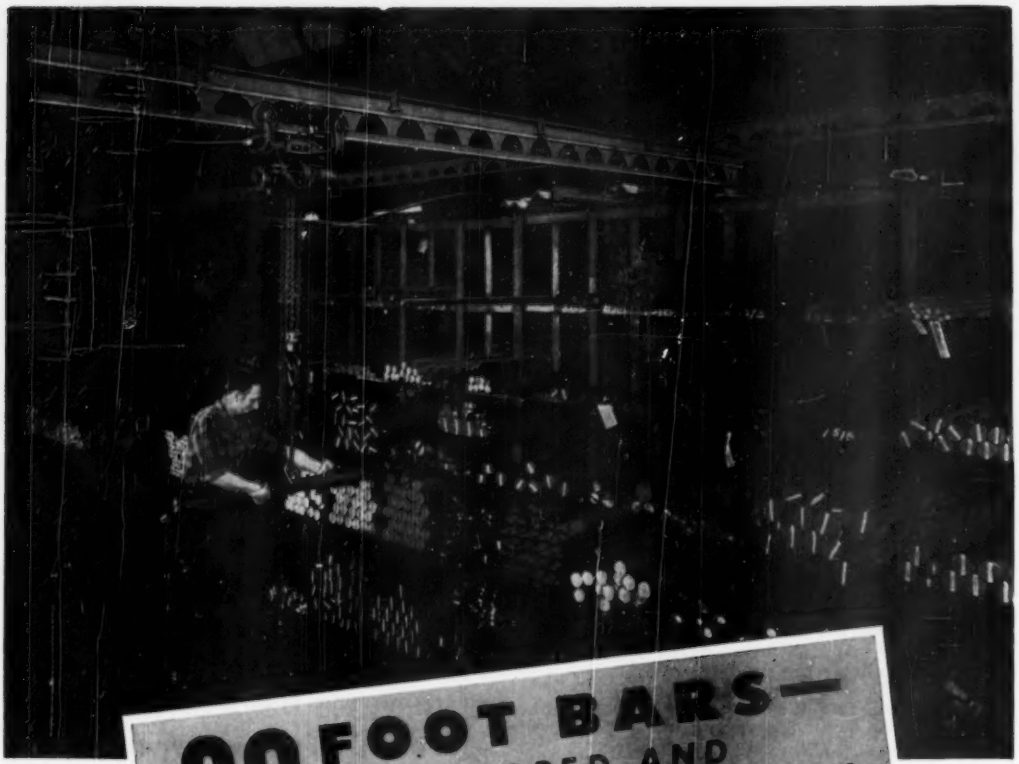
CARBOLOY COMPANY, INC.
11149 E. 8 Mile Street **Detroit 32, Michigan**

YOU CAN GET THEM FAST . . . ADAPT THEM FAST FOR UP TO 80% OF YOUR GENERAL MACHINING

You save time and money on both rush jobs and everyday production when you use Standard Carboloy Tools. For example, these 11 (right-hand styles not shown) low-cost styles will do up to 80% of your general machining. Whatever the job, it pays to standardize with Standard Carboloy Tools.

"The least number of tools for the greatest number of jobs"

IT PAYS TO STANDARDIZE WITH STANDARD CARBOLOY TOOLS
13,000,000 USED BY INDUSTRY



20 FOOT BARS— STORED AND HANDLED EFFICIENTLY

It is not only faster and easier to store and handle stock this way, but safety is greatly improved.

WITH a simple rack arrangement and overhead tramrail crane to serve it, long unwieldy steel stock can be stored in an orderly fashion and grouped according to shape, size and alloy.

The smooth rolling crane with hand-propelled or electric hoist makes it easy for a man to handle the bars in and out of the rack and deliver them to the saws or machine tools directly without rehandling.

What a vast improvement this is over the haphazard time-consuming way of storing and handling stock still prevalent in so many plants today. There is no tugging, lugging and back-breaking lifting while searching for stock needed. The stock is always in its place where it is quickly found. There is no uncertainty as to the amount on hand, because the supply is out in the open where it can always be seen.

Hundreds of metal-working plants and steel warehouses are now enjoying the many advantages that Cleveland Tramrail equipment provides. There are installations of every type from simple hand-propelled carriers and cranes to complete automatic systems that transport materials without need of accompanying operator.

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THE CLEVELAND CRANE & ENGINEERING CO.
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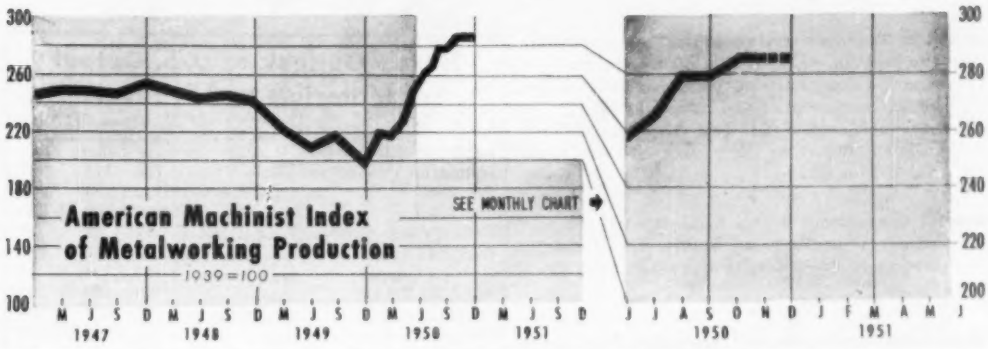
CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Gaging Metalworking



Manufacturers Struggle to Get Materials

Getting materials is the chief headache of metalworking industries. Top management is devoting large share of its time to this problem. Manufacturers fear that if shortages of materials force them to lay off men temporarily, they will never get them back.

The squeeze already is being felt in some spots. One large company is cutting weekly hours in most departments from 48 to 40 until it can get relief on materials. Others may have to follow suit soon.

Nevertheless the bite into metalworking output won't be severe for at least another month or longer. Drastic curtailments, for the most part, will not come until late in first quarter.

• • •

Metalworking production in December will be on a par with November, based on manhours worked. American Machinist's index is estimated at 285 this month. This means that Metalworking has stayed on a very high plateau during the fourth quarter. That plateau is almost three times as high as the 1939 rate.

• • •

Steel defense requirements in first quarter will take 15% of output. But in plates, ratio will be nearer 30%. Users are doing everything possible to get what they need. Two large companies say that one-fourth their tonnage is coming from conversion deals. Steel sheet importations from Germany and France are sizable.

• • •

Many complaints are heard against NPA's use of first six months of 1950 as base period for determing how much metal can be cut up. These complaints stem from fact that fourth quarter production was much larger than first half. Cutbacks thus will be much greater than percentages NPA decreed.

October shipments of National Tool & Die Manufacturers Association members broke a six-year record in volume, 56% ahead of October 1949 and 28% above September this year.

New orders also poured into the shops. Volume was 5% ahead of September, which was slightly under August, the banner month this year. Eighty percent of new orders were for civilian production, the balance for defense.

Backlog, at its highest mark since March 1947, is sufficient for two months output.

• • •

Pacific Northwest is shy on defense contracts, and finding it tough to get materials for non-defense production. Only a handful of firms—Boeing is a big exception—have defense contracts to work on yet.

Industries in this area feel they are being discriminated against in obtaining steel, in favor of eastern companies.

INDEX

	DEC. '50	NOV. '50(p)	OCT. '50(r)	NOV. '49
	285*	285	285	204
Machinery		266	261	187
Electrical Manufacturing		333	333	233
Automobiles, Trucks		258	264	176
Transportation Equipment		277	273	229
Other Metalworking		308	308	223

AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on manhours worked in the five components above.

*Estimated (p) Preliminary (r) Revised

Gaging Business

President Truman's declaration of an emergency and creation of Office of Defense Mobilization means a quickening of rearmament effort. But an all-out operation is a long way off.

All-out would mean that 40% of all goods and services would go into the military. It now looks like a 20% bite.

• • •

Rate of rearmament orders has increased from $2 billion a month to $3 billion. This indicates civilian cutbacks may be more than anticipated earlier.

• • •

There is another reason for predicting a more severe shortage of materials ahead. A global plan of allocating materials is in the works. U. S. intends to share what it has with its allies. That spells less materials for U. S. manufacturers.

• • •

First quarter expenditures for new plant and equipment will be the highest on record for that period. Total is estimated at $4.8 billion, as against $3.7 billion in same period in 1950 by Securities and Exchange Commission. Outlay is partly stimulated by government bait: certificates of necessity permitting quick write-offs.

• • •

On basis that rearmament program will reach its peak in 1952 and taper off after that, General Electric has estimated industrial production in U. S. as follows (based on Federal Reserve Board index): 1951-220; 1952-230; 1953-225.

GE also estimated combat material expenditures to be: 1951-$17.5 billion; 1952-$25 billion; 1953-$21 billion.

Here's Outlook on U. S. Output of Materials and Products

MATERIALS AND PRODUCTS	UNIT	MONTHLY RATE — 1st Half 1950	MONTHLY RATE — Current	MONTHLY RATE — June 1951
Industrial Production	(1935-39 = 100)	189	214	237
Pig Iron	Thous. short tons	5,190	5,700	5,900
Steel	Thous. short tons	7,850	8,200	8,600
Primary Aluminum	Thous. short tons	57	63	70
Refined Lead	Thous. short tons	105	112	118
Refined Copper	Thous. short tons	47	54	57
Machine Tools	(1945-47 = 100)	70	102	200
Passenger Cars	Thous. units	625	600	400
Freight Cars	Units	2,250	6,500	10,000
Tractors	Thous. units	60	40	50
Refrigerators	Thous. units	500	399	360
Television Sets	Thous. units	450	819	410
Home Radios	Thous. units	870	942	625
Washers	Thous. units	334	440	308

(June 1951 estimated by McGraw-Hill Dept. of Economics)

These estimates were made before a state of national emergency had been declared. All the above figures are subject to upward revision as the rearmament program is expanded in size and quickened in time.

• • •

New excise taxes are planned to control consumer demand for autos and appliances. However, existing controls have slowed credit buying. Consumer credit in October increased $51 million over September, compared with gain of $300 million in each of preceding five months. Refrigerator sales in October were down 22% from previous month, but up 50% from 1949 level.

WEEKLY BUSINESS INDICATORS

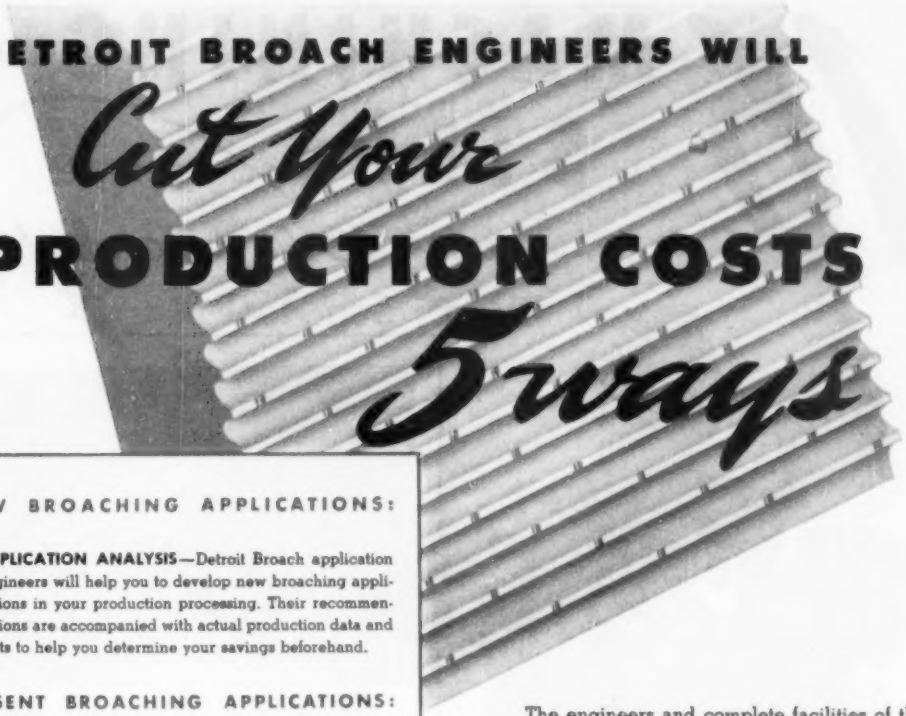
	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	226.5	218.0	186.8
Steel ingot operations (% of capacity)	101.3	100.5	94.1
Electric power output (million kilowatt hours)	6,909	6,716	5,881
Production of automobiles and trucks	159,862	152,107	52,514
Engineering construction awards (Eng. News-Record—millions)	$136.5	$484.9	$119.4

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators, domestic sales (thousands of units)	399	512	253
Vacuum cleaners sales (thousands of units)	331	328	273
Washers sales (thousands of units)	440	424	334
Household electric ranges sales (thousands of units)	130	156	73
Television receivers production (thousands of units)	819	817	305
Radio receivers AM and AM-FM production (thousands of units)	442	832	670
Gear sales index (1935-1939 = 100)	564.8	658.5	242.3
Foundry equipment new orders index (shipments 1937-1939 = 100)	526.8	483.8	133.5

* Seasonally adjusted.

DETROIT BROACH ENGINEERS WILL *Cut Your* PRODUCTION COSTS *5 ways*



NEW BROACHING APPLICATIONS:

1 APPLICATION ANALYSIS—Detroit Broach application engineers will help you to develop new broaching applications in your production processing. Their recommendations are accompanied with actual production data and costs to help you determine your savings beforehand.

PRESENT BROACHING APPLICATIONS:

2 INCREASED PRODUCTION—Detroit Broach will study your present broaching applications to determine means of increased production from them. This is often possible through improved work-clamping, multiple loading of work on each machine slide and many other ways.

3 INCREASED WORK LOAD—Often, Detroit Broach can show manufacturers how they can increase the work load on their broaching machines through the design of universal-type tooling that is quickly convertible to more than one part. This can make it economical to broach a number of low-production parts whose sum production would keep equipment busy full time.

4 INCREASED BROACH LIFE—Often tool life can be increased by changing chip load, length, hook, etc., of broaches. In addition, the steel used and its heat-treatment are extremely important in tool life. Detroit Broach engineers will study your broaching applications and make recommendations for these changes wherever they would be advantageous.

5 LOWER BROACH REPLACEMENT COST—Through redesign of broach tools, forms can be broached progressively in one stroke by a number of inserts, each containing part of the form. This simplifies the form in each insert which decreases the original cost of the tools, cuts broach sharpening time. If any part of the form is damaged or worn, only that insert need be replaced.

The engineers and complete facilities of the Detroit Broach Company are at your disposal to help you get more production per hour and per dollar . . . on new as well as present broaching applications.

Detroit Broach Company specializes in the design and manufacture of broaches and broaching tools exclusively. Through this specialization their engineers are qualified experts on all types of broaching on all types of broaching machines. Some of the tooling principles that have emanated from this knowledge have been the great advancements in modern broaching. The consistent success of this tooling has made Detroit Broach the world's largest manufacturer of broach tooling exclusively.

Why not take advantage of the services shown at the left and have one of our application engineers make his recommendations in your shop. Many of the country's leading manufacturers have already found it a sure way to reduce production costs.

DETROIT *Broach* COMPANY
20201 SHERWOOD AVENUE
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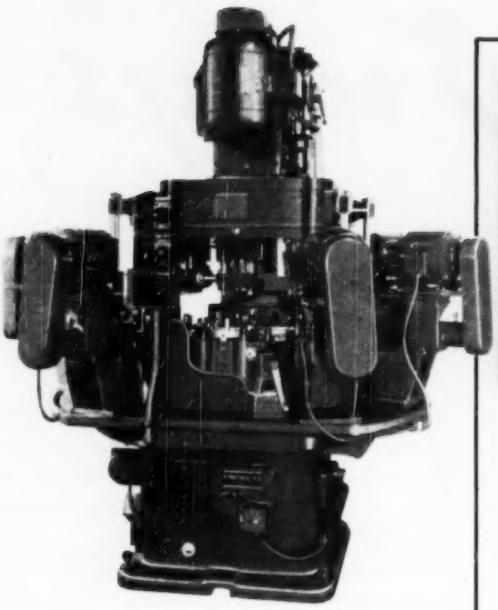
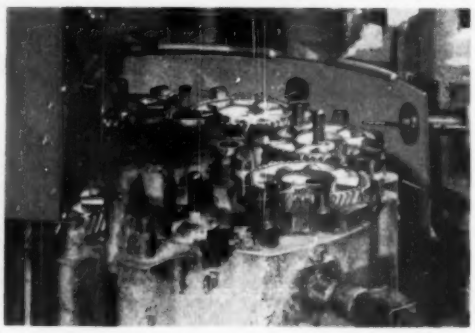
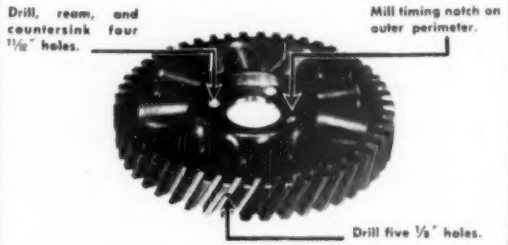
16 MACHINING STEPS

...every 13½ seconds!





Two cycle operation performed on a camshaft gear; production 288 pieces per hour at 80% efficiency. The machine is a four station vertical type unit with a 29" table. A self contained hydraulic unit is mounted on the column. This unit carries an eleven spindle vertical head and a single spindle milling head driven through the vertical multiple spindle head. Five single spindle quill type heads, independently motor driven, are mounted radially on the platen.



Each Morris High Production Machine is designed for a specific job. The result is more completed parts—in less time—at lower cost.

If your work requires automatic multiple drilling, reaming, tapping, boring, etc., on a mass production basis, consult MORRIS to meet rigid production demands and specific job requirements.

THE MORRIS MACHINE TOOL COMPANY

933 HARRIET STREET CINCINNATI 3, OHIO

"A better product at less cost— with MORRIS ENGINEERED PRODUCTION"

Fellows MOR-SPEED Line

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

A Defense Profits Tax

Congress is about to pass an excess profits tax which promises to do far more harm than good.

It has all the defects of the World War II law. Moreover, it contains "extraordinary potentialities for raising havoc with our economy," to quote an astute observer.

THE PROPOSED LAW takes 1946-1949 as the base period. That's bad to begin with. It will result in gross inequities.

The automobile industry, for one, had plush earnings then. It would get the highest exemption and pay the lowest tax. Yet, it may benefit handsomely from the rearmament program.

By contrast, consider the builders of production equipment. They did poorly, in too many cases, in the postwar years. Some were close to the break-even line, and others had losses. A number went out of business altogether.

These builders will produce for rearmament tooling far more machines than they normally would. They will create thereby a surplus problem which later will plague them, as it did after the last war, and will deprive them of part of their market for new machines following the present emergency. Yet the proposed excess profits tax will not let them accumulate any financial fat to carry them through lean times.

The truth is that it is impossible to select any basic level of earnings above which profits can be defined as "excessive" without wholesale inequities, damaging restraint on new and growing businesses, and undue restrictions on new and growing processes of production.

GREATEST WEAKNESS of the tax is that it puts a premium on inefficiency. Any incentive for holding down costs is removed. After all, Uncle Sam pays most of the bill. This waste added five billion dollars a year to the cost of fighting World War II, testifies Roy Blough, newest member of the President's Council of Economic Advisors and one of the authors of the previous excess profits tax law.

There are many other good reasons why the pending bill should not become law. It penalizes the progressive manufacturer who has spent generously for research and product development. It makes it hard for most companies to finance purchases of replacement equipment.

It discourages independent initiative and risk taking. It falls with unusual severity upon new businesses and upon established enterprises which are rapidly growing. Beardsley Ruml describes the tax as "an evil brew of inequity, exception, exemption and privilege."

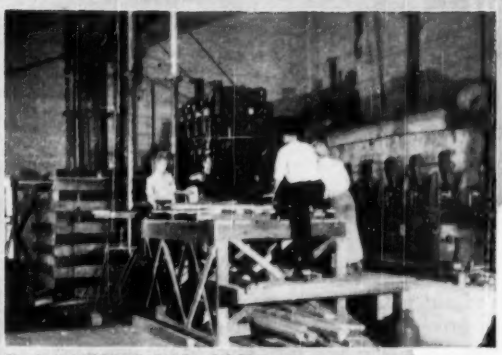
THE LAUDABLE OBJECTIVES of a complicated excess profits tax can be attained much more easily by imposing a simple defense profits tax. This tax would be a defense surtax superimposed on the regular corporation tax.

In that manner all companies would bear their share of the defense tax load. Such an emergency tax would yield more revenue than the proposed excess profits tax, and it would eliminate the latter's numerous weaknesses.

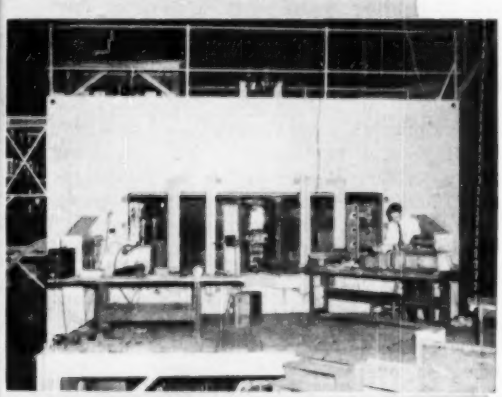
We urge Congress to abandon the excess profits tax already passed by the House and substitute for it a defense profits tax.

Burnham Finney

a cincinnati shear helps build the biggest betatron in the world



Cincinnati 10014 Series Special Shear cutting laminations for the Betatron.



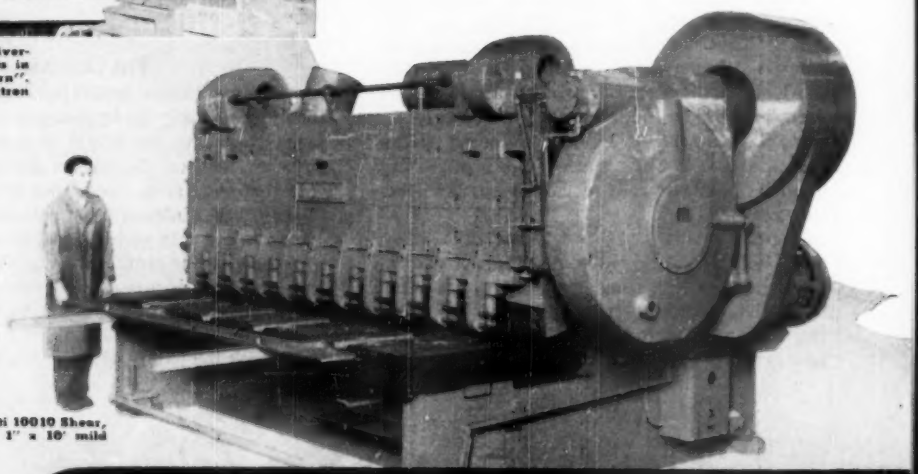
Betatron was built by University of Illinois physicists in sunken "Betatron Barn". Flux magnet of Betatron weighs 275 tons.

University of Illinois builds powerful radiation machine to split atoms.

Betatron produces 300 million volts, speeds up electrons to 186,000 miles per second. First job for this Betatron (world's biggest atom smasher) is the study of the mysterious sub-atomic mesons.

A Cincinnati Shear cut the laminations for this spectacular machine. Other Cincinnati Shears also are widely used by electrical manufacturers for shearing lamination stock accurately and without burrs. Knife life is unusually long on a Cincinnati even on this abrasive material.

Write for Catalog S-5 on Cincinnati All-Steel Shears, the shears of accuracy.



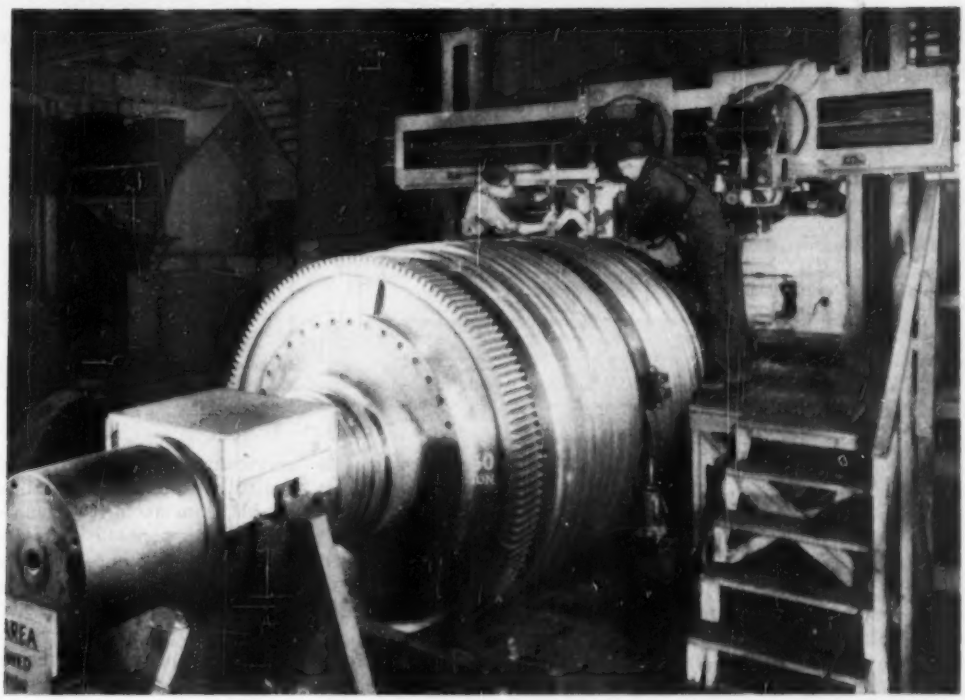
Cincinnati 10010 Shear, capacity 1" x 10' mild steel.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

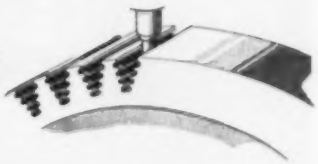
SHAPERS · SHEARS · BRAKES

CINCINNATI



Slotting setup for 72-in. disk on low-pressure, 50-ton spindle for 147,000-kw steam turbine is made on planer table. Broaching head is being positioned to finish 144 axial blade-root slots

'CHRISTMAS TREE' SLOTTING JOB CALLS BACK OLD PLANER



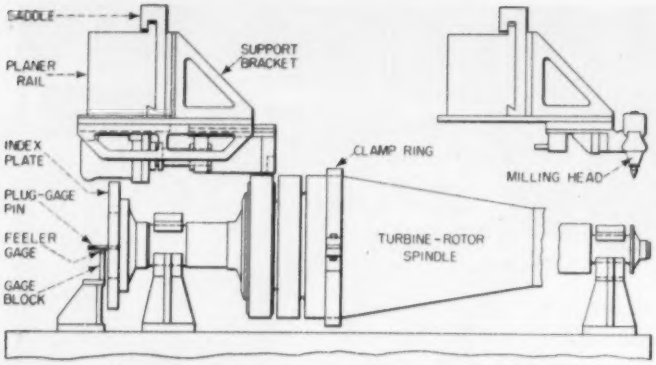
BY S. K. RUDORF, Supt. Maint & Tooling Section, ALLIS-CHALMERS MFG CO

Allis-Chalmers tool engineers 'retreaded' a 10x10x20-ft retired planer, added special milling and broaching heads on cross-rail saddles, and provided a gage-block indexing mechanism so axial slots could be cut for turbine blades. The low-cost equipment meets specifications accurately

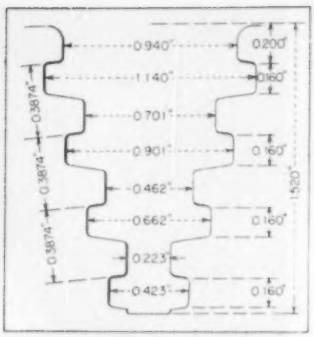
SPINDLES for Allis-Chalmers steam turbines are machined with circumferential grooves to lock blade roots in place. Axial slots through two or more disk sections in each turbine spindle, which may be as large in diameter as 6 ft, are of multiple-wedge shape — hence the name "Christmas Tree."

The planer table is actually moved only to locate the spindle, once it has been blocked up and clamped, in relation to the heads. Vertical positioning of the cutters is done by lowering the planer cross-rail, which carries milling and broaching heads instead of conventional slides and clapper boxes, by hand.

Only one head is operated at a time, the idle head being moved aside while the other is centered over the work spindle. A large index plate, bolted to the coupling end of the spindle, works with gage blocks and an index pin to locate the spindle



Tooling arrangement for milling and broaching 40-in. spindle has index plate, gage blocks, and pin behind head for rotational location of the work



Inverted "Christmas-Tree" slot is typical of machined recess that grips turbine-blade roots securely

rotationally for each cut. The spindle is clamped after location by screw jacks acting against a heavy clamp ring around the spindle body.

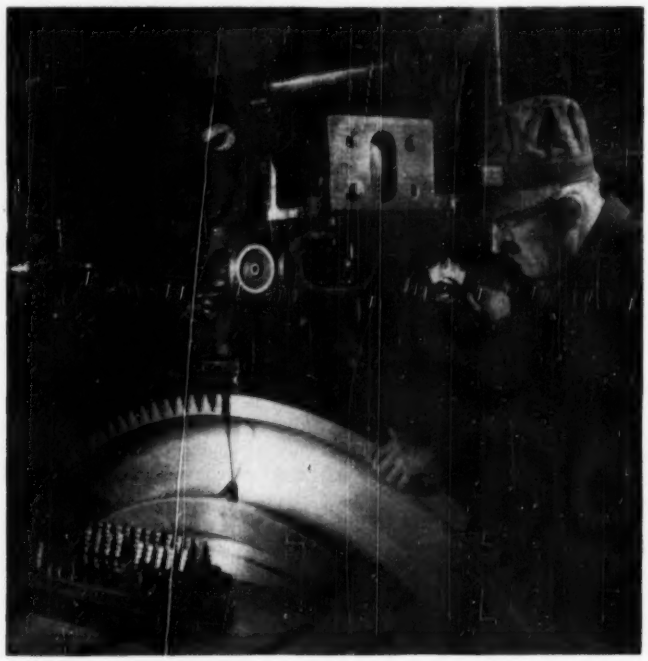
Both milling and broaching heads are supported from inverted ways under support brackets bolted to the faces of the planer saddles. The heads have about 9 in. longitudinal feed, making it possible to cut axial root slots up to 7½ in. wide.

The milling head is powered by a 1/3-hp vertical milling attachment bolted to the front end of the traversing slide. A ¾-hp reversible motor drives a feed-screw that moves the slide longitudinally. There are six milling speeds, from 500 to 4000 rpm. Although the spindle materials would stand higher feeds, design considerations dictate flimsy cutters so the traversing feed is usually limited to 5/16 ipm.

The broaching head is reciprocated by a double-acting hydraulic cylinder with an 8-in. bore and 9-in. stroke at about 14½ ipm. Power is supplied by a geared pump rated at 7½ gmp at 1000 psi, driven by a 5-hp motor. The unit, with its supply tank, is mounted on the rear of the planer's top rail to minimize the length of flexible hose needed.

Support blocks and gage anvils at each end of the cross-rail and on the outer side of each saddle permit locating each head over the spindle with pin gages. Normally, the milling head completes all cuts before it is moved aside to make way for the broaching head. Then each slot is successively rough- and finish-broached before the spindle is indexed for the operations on the next slot. Broaching often requires up to 23 passes with as many individual broach blades.

This method for machining axial slots was recently adapted for cutting blade grooves in the rotor spindle of a gas turbine.

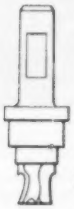


Rough-forming operation with end mill utilizes boxed cutters in succession. Milling spindle is adjusted for speed by shifting V-belt

EIGHT SPECIAL END MILLS ROUGH OUT AXIAL GROOVES

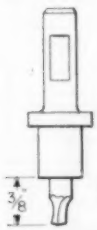
Mill 0.940-in. width
0.935-in.-dia cutter
Speed ..... 500 rpm

Mill 0.701-in. width
0.695-in.-dia cutter
Speed ..... 500 rpm

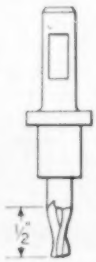


Mill 0.462-in. width
0.457-in.-dia cutter
Speed ..... 700 rpm

Mill 0.223-in. width
0.218-in.-dia cutter
Speed ..... 1025 rpm



Mill 0.223-in. width
0.218-in.-dia cutter
Speed ..... 1025 rpm



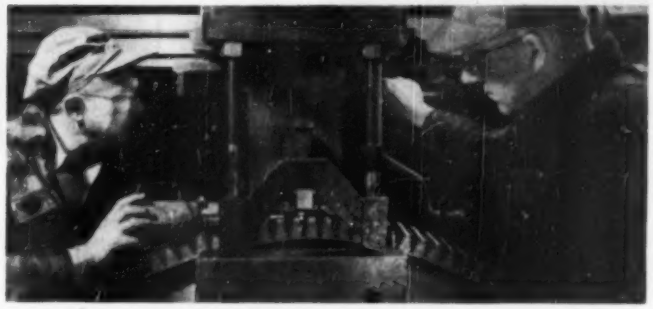
Mill 0.223-in. width
0.218-in.-dia cutter
Speed ..... 1025 rpm

Rough-form
full groove shape
Speed ..... 500 rpm

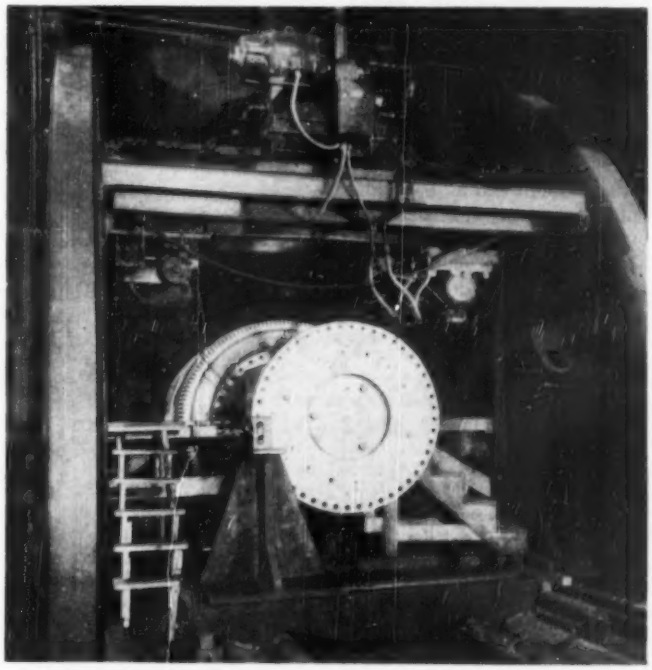
Finish-form
full groove shape
Speed ..... 500 rpm

End mills are 18-4-1 high-speed steel, hardened to 63-66 Rc to cut the chrome-nickel-molybdenum steel alloy of the turbine spindle at 5/16-ipm feed

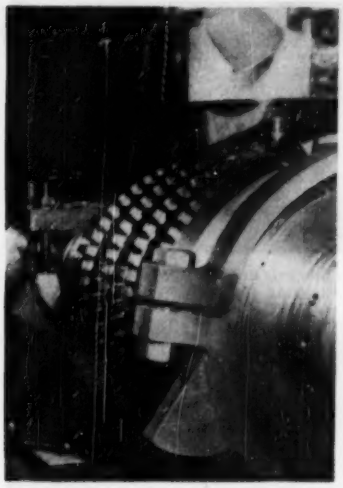
Long pin gages set between brackets and anvil gages on planer cross-rail and saddles to center cutting head over turbine-spindle axis



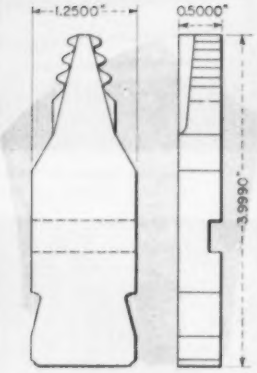
Finishing job requires light passes for dimensional accuracy and high surface finish with push-broach cutters



Steel frame in back of top rail holds motor-driven hydraulic pump and tank which power cylinder of broaching head. Pedestal is reference surface for gage-block and pin system that indexes spindle



Slotting setup for experimental 20-in. spindle was made on large vertical miller. Two disks had 38 axial slots and four had 54. Cutters were cyanide-hardened to machine the heat-treated Timken alloy

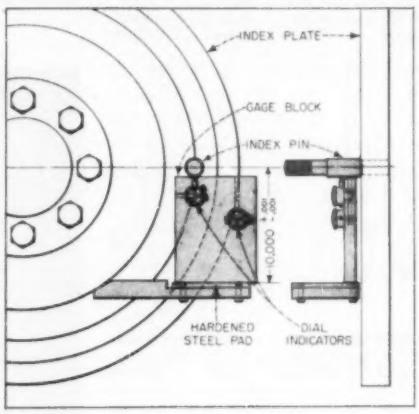


Broaching cutters for both jobs were 1.2500 in. wide, 0.5000 in. thick, and had a 0.3755-in. keyway across back face. Relief was 5°

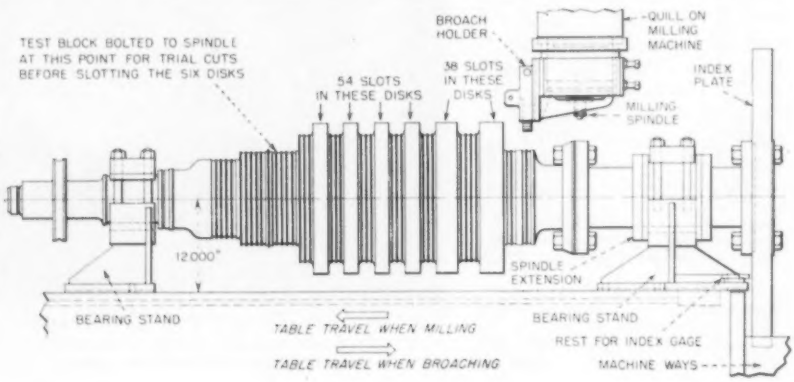
Root shapes for gas turbine were form-ground with crush-dressed wheel while gripped in low-melting-point alloy, then broach cutters were separated and mounted on milling-machine quill

The turbine was made for Bituminous Coal Research, Inc., who will install it in a coal-burning, turbine-electric locomotive.

For this job, a setup was made on a large vertical miller where complete milling and broaching was done before the spindle was indexed for the next slot. A series of eight end mills roughed out the slot, and then a set of 23 push-broaching cutters finished. The work was traversed longitudinally under the cutter for each pass, instead of traversing the cutters as in the planer setup.



Indexing for gas-turbine spindle was done by reversing gage block between index on 27-hole circle, moving spindle 1/54 turn each time. Dial indicators registered tight contact.



Tooling slotted small spindle on vertical miller without movement of quill between milling and broaching cuts. Miller spindle and broach holder were kept always in line with slot being made.

GOOD CARBURIZING PRACTICE

V...Salt Baths Save Process Time

Fast heating and case depths akin to those produced by other carburizing processes are possible with liquid-salt-bath carburizing. Advantages of the process outweigh its shortcomings, which is the reason it is being adopted rapidly

BY T. A. FRISCHMAN,
Chief Metallurgist, Axle Division,
EATON MFG. CO.

SALT BATH carburizing is an outgrowth of the well-known cyaniding bath, but produces much deeper cases higher in carbon content and lower in nitrogen content. With liquid-salt carburizing baths, heavy cases ranging from 0.040 to 0.250 in. depth can be produced in comparison with the straight cyanide, bath where 0.010 in. depth is generally regarded as the maximum. Characteristics of the deeper cases produced by salt baths are similar to cases produced by the pack or gas method, especially when the carburizing temperature is 1700 F or above. However, there is a higher nitrogen content in the case produced in the salt bath.

In salt baths, carburizing action is derived from carbon in the cyanide radical of sodium cyanide. Besides this chemical, the salts are usually made up from combinations of sodium chloride, sodium carbonate, potassium chloride, barium chloride and calcium chloride. Powdered carbon or graphite is usually added to the mixture to produce a protective cover over the molten bath. This cover cuts down radiation losses, but the prime purpose is to retard breakdown of cyanide into undesired carbonate.

Carburizing salts owe their efficiency to catalysts or activators, such as barium chloride or calcium chloride. Each proprietary bath has one or another of these accelerators to stabilize the bath at elevated temperatures and hasten the carburizing reaction. Without these catalysts it would be impossible to obtain deep cases with salt baths.

Types of Carburizing Baths

By varying the chemical composition of the baths, they can be made to operate most efficiently to produce light, medium or heavy case depths. Light-case depth is generally considered to range from 0.003 to 0.015 in., medium from 0.015 to 0.040 in., and heavy from 0.040 up to as high as 0.250 in. Important distinction between baths is whether they are compounded on the basis of a single- or a two-component bath. By this is meant: either a single mixture or two different mixtures are used, depending upon certain operating conditions. Where "drag-out" is heavy (molten salt is carried along with workpieces) the single-type salt mixture can be used without difficulty in maintaining the correct chemical analysis. Constant replenishment will keep the bath in balance. However, where drag-out is light, the two-component bath finds favor because, lacking replenishment, higher concentrations of bath-balancing ingredients can be incorporated into the second mixture.

It is not uncommon for some plants to add nothing other than the second mixture, once having the bath started on the first mixture. In the two-component bath the starting salt usually contains about 30% sodium cyanide in addition to other fusible materials. However, at elevated temperatures, the cyanide breaks down eventually into carbonate, carbon and nitrogen, thus requiring periodic replenishment.

Here is where the second salt mixture enters the picture. As a general rule, the mixture contains 60% sodium cyanide to furnish the necessary cyanide and stabilizing ingredients to keep the bath functioning properly.

If the single-salt mixture is used where light "drag-out" is encountered, excessive "bailing out" or discarding of salt must be made to maintain the cyanide content within the prescribed working range. Obviously, large scale bailing-out is costly and pointless when two-component type baths are available.

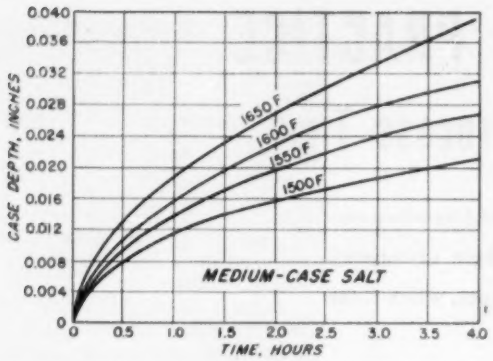
Other factors influencing excessive cyanide replenishment, besides "drag-out," are: (1) exceeding the recommended maximum working temperature, (2) prolonged idling periods without making customary additions of new salt, (3) not maintaining proper coverage of the bath with amorphous carbon or graphite, (4) laxity in not adding new salt regularly to keep the bath in balance, and (5) not permitting proper drainage of molten salt before quenching.

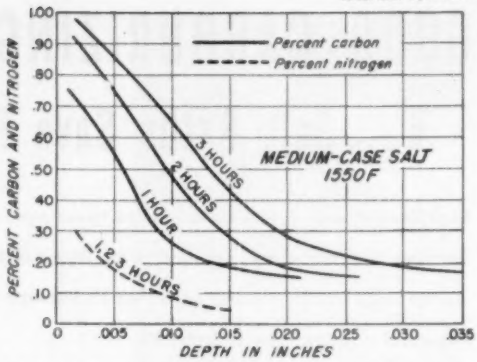
Effect of Temperature and Time

For a given type of bath, maintained at its proper efficiency, the greatest single factor in bringing about depth of penetration is temperature, and next in importance is time. Curves illustrating the relationship between temperature and time of a barium-activated, medium-case-depth bath and a barium-activated, deep-case bath are shown.

Carbon content at various depths of case is affected by the carburizing temperature and the characteristics of the salt bath. For example, SAE 1020 steel held for 2

American Cyanamid





Time-penetration curves for medium-case salt (barium activated) disclose that a case depth of 0.024 in. is reached in a little over 1.5 hr at 1650 F, but the same case depth requires twice as long to attain at 1550 F. Nitrogen content in cases produced with medium-case salt is higher than when a deep-case bath is used (see page 91)

hr in medium-case salt at 1550 F has a carbon content of 0.48% and a nitrogen content of 0.09% at a case depth of 0.010 in. For the same exposure in deepcase salt held at 1750 F, the carbon content is 0.90% and the nitrogen content about 0.12% at a case depth of 0.012 in. (see curves).

From tests, it is evident that the carbon content at the surface of steel treated in deep-case salt at 1750 F is comparable to that obtained with certain solid carburizers, as well as with straight natural gas in gas carburizers at corresponding temperature. And a less familiar point is that low nitrogen content is characteristic of cases produced at 1750 F as compared with higher nitrogen content resulting from treatment at 1550 F.

Furnace Equipment

Prevailing furnaces for liquid-salt bath carburizing are of the following types: (1) externally heated either with gas, oil or electricity, and (2) internally heated, either immersed electrode or immersed fuel-fired heater. The externally heated salt-bath furnaces are mostly of the round pot type. Rectangular furnaces incorporating mechanization for continuous advancement of workpieces through the salt bath are also built. Either of these types of furnaces can be heated by gas, oil or electricity. Wherever possible, automatic temperature control should be installed. Pots for containing the molten salt can be either cast iron, cast steel, pressed steel or cast heat-resisting alloy. The last gives the least trouble when used at temperatures over 1600 F, and is virtually a necessity if low maintenance costs are to be realized.

Immersed - electrode, salt - bath carburizing furnaces are made by several firms. A low-voltage current impressed across the electrodes uses resistance of the liquid salt to create the heat necessary to maintain the bath temperature and to heat the charge. This type of furnace is efficient from standpoint of heat input and requires rather small floorspace. Ordinary steel pots can be used to contain the salt; temperature variations throughout the bath are about 5 F. There are still other advantages, but those just cited should suffice for the time being.

The furnace may have only a single pair of electrodes, unmechanized, or be a completely mechanized bath, incorporating several sets of electrodes. Large mechanized installations may extend for a considerable distance horizontally, or be designed to accommodate long workpieces suspended vertically, in which case the furnace would be classed as the deep type. While fuel is always to be considered as a major expense item, the rapid heating-up feature and relatively over-all fast time required to produce a definite case depth often nullify the extra cost of electricity and the salt additions to the bath.

The simplest way of finding how quickly a part will come up to heat is to put several pieces simultaneously into molten salt at the desired working temperature and then withdraw them at predetermined intervals, say ½ min. apart. In short order, the approximate time to reach bath temperature will be learned by visible comparison between the piece and the bath. Or reference can be made to literature published by various manufacturers on the subject of heating rates.

In salt-bath carburizing, transfer of heat from bath to workpieces is accomplished by conduction; that is, by intimate contact between the molten salt and the articles. This intimate contact accounts for the rapid rate of heat absorption, provided the differential between the heat input and conductivity of heat in the charge remains high. For this reason it is better to have a bath too large in volume than too small.

Rapid heating rate of liquid carburizing baths is the prime reason for producing equivalent case depths so much quicker than with the other methods of carburizing. Obviously, the sooner the steel is raised above its transformation temperature range and becomes austenitic, the sooner it can dissolve or take up carbon and diffuse it inward. Light-case and medium-case depths are obtained through the range from 1550 to 1650 F; deep cases are generally developed with carburizing temperatures from 1700 to 1750 F.

Versatility of Process

There appears to be no limit to the size and shape, either large or small, of the article to be liquid carburized, so long as the container or pot will accommodate it. Further, the method is adaptable to producing any case-depth range within reason, and is not especially confined to the use of customary carburizing temperatures. Often the method is employed for carburizing at temperatures as low as 1550 F. Temperature in this range is required to minimize distortion, and can also be used for reheating articles previously case-hardened or made from medium- to high-carbon steel where some surface carbon pick-up is not objectionable but in many instances is desired.

Brazing can be combined with the carburizing operation. Where cyaniding treatments are specified and there is insufficient volume to warrant a separate bath, the liquid carburizing bath can be used and will develop a superior case with correspondingly higher carbon and lower nitrogen content.

Where selective carburizing is required, liquid carburizing provides an easy solution. If for instance only one extremity of the part requires case hardening, that portion only need be immersed in the bath. With the pack or gas method, carbon stop-off or equivalent methods would be necessary for the other extremity.

Liquid carburizing is easily adapted to mechanization. The only parts exposed to heat of the carburizing action are the carrier or supporting fixtures and the workpieces. Means of conveying the pieces through the liquid salt are: (1) screw-conveyor, (2) "jackrabbit" mechanisim, (3) merry-go-round, (4) rotary basket, and (5) elevator mechanisms. All these are readily adaptable to the liquid carburizing process and also serve as a means of combining subsequent operations such as quenching, cleaning, tempering and transferring.

Furnace Operation and Control

A number of matters will interfere with continued trouble-free operation if not conscientiously watched. For instance, in externally fired pot furnaces, using either oil or gas, burner adjustment and prevention of flame impingement are vital to maintaining long pot life. Salt level likewise is important. If bath line is allowed to recede too low, the upper portion of the pot within the heating chamber will quickly fail. There will be no molten salt at this location to conduct the heat away. The cause of frequent brick relining jobs is often traced to molten salt seeping down between the pot and interior brick lining of the furnace, resulting in chemical reactions taking place between brickwork and salt. Proper setting of the pots cannot be over-emphasized.

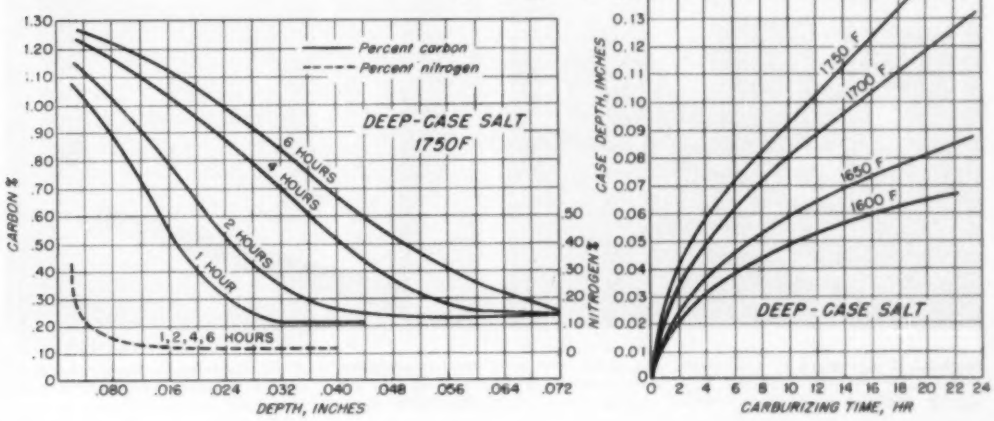
Furnace flues should always be kept clean and open, to eliminate possibility of too high a back pressure in the combustion chamber. Heavy sludge accumulation in the bottom of the pot from salt breakdown is another source of localized overheating, because circulation is obstructed, thus causing "hot spots."

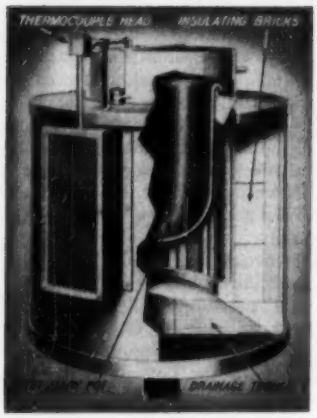
In operation of immersed-electrode, salt-bath furnaces, low-maintenance expense is secured by proper adjustment of electrodes, if possible. Care in this respect is repaid many fold in electrical efficiency, heating speed and good overall operation. Sludge must also be removed at regular intervals to avoid interference with travel of workpieces through the furnace, fouling of the electrodes, reduction in the working volume of the salt, and lack of control.

Chemical control of a liquid carburizing bath can be made simple

Case composition is affected by both the bath characteristics and the operating temperature. Penetration is deeper with deep-case salt operated at 1750 F, but note that nitrogen content falls off more quickly that when medium-case salt is operated at 1550 F on SAE 1020 (See page 90)

American Cyanamid.





Hevi-Duty Electric Co.

Electric heating elements are placed around the walls of the heating chamber of this pot-type furnace

to technical, depending upon plant conditions, type of salt used, skill in operating the bath, work characteristics such as size and shape of part treated, operating temperature, persistent attention to maintenance of carbonaceous cover, and degree of uniformity in case characteristics desired. Most carburizing salts are compounded so that if rate of dragout, as well as rate of cyanide breakdown, is once established, periodic replenishment can be set up on regular schedule. If this schedule is conscientiously followed, surprisingly little chemical control will be required.

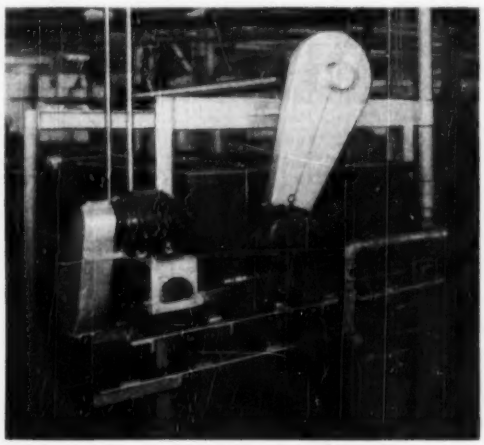
Good control is easier to establish in installations where perhaps only one or two operators tend the operation. In time they learn to observe different characteristics in the working of the bath. Where several men are employed, especially over three-shift operation, the operators as a rule do not become as skillful. Then it is best to make chemical determinations for cyanide content at regular intervals. Moreover, the use of regular case-depth test-pins and micro-examination should not be relaxed at any time if possible.

Deep-case carburizing baths are as a rule controlled to 10% cyanide, and medium to light case, at from 15 to 20%. Factors most likely to upset these percentages are: (1) thinning or loss of carbon cover, (2) insufficient replenishment of new salt or cyanide equivalent, (3) low dragout loss, (4) long idling periods without new salt additions, (5) overheating, and (6) improper maintenance of bath proper.

If liquid carburizing baths must be used intermittently, or not over week-ends, best practice is to idle the bath at reduced temperature, even though the fuel expense might seem high. The bath will be kept in better working order and the equipment will be less exposed to thermal shock, whether fired externally or internally. Also, internally heated baths present a starting up problem, in that the salt must be melted before sufficient resistance to the current is established to generate heat in the bath.

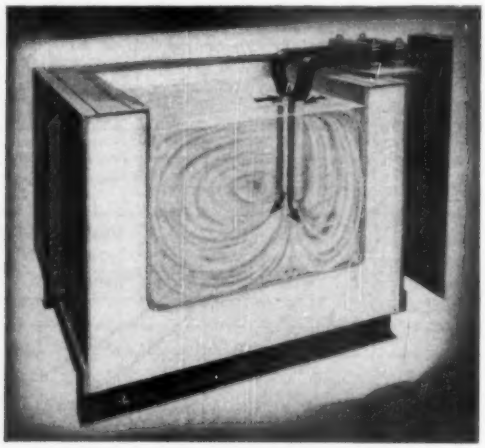
Work-Supporting Fixtures

Design of work-supporting fixtures follows no set pattern, because parts vary so greatly in size and shape. Workpieces may range from tiny machine parts to large sections of armor plate. Ordinary baling wire is extensively used for stringing up many parts for suspension. Wire-mesh and perforated-metal baskets are much used for handling of small parts. Specially designed hooks, racks and cradles are employed. Many plants find it profitable to make work fixtures from heat-resisting alloy such as 18-8 chromium-nickel stainless steel 35-15 nickel-chromium, 60-12 nickel-chromium and even 80-13 nickel-chromium alloy. On the basis of best performance at lowest cost, when using heat-resisting alloy, 18-8 and 35-15 nickel-chromium alloys are the most popular materials. Experience has shown that 80-13 nickel-chromium alloy does not give the service life in proportion to the added cost when used in cyanide salt baths.



Electric Furnace Co.

Mechanical movement of workpieces is possible with a rectangular pot-type furnace. This one is externally heated, gas-fired



Ajax Electric Co.

Heat is generated between immersed electrodes by resistance of the salt, and the magnetic field causes good circulation of the molten bath

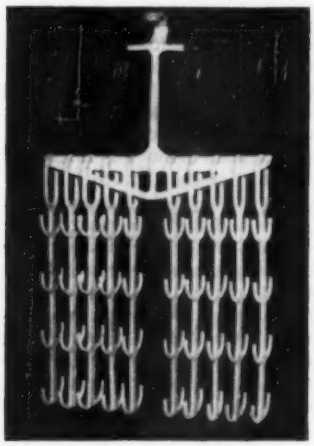
Cleaning of Workpieces

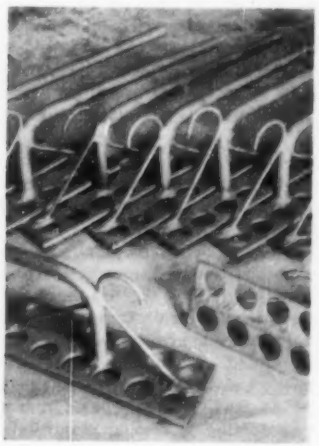
For many years, removal of solidified salt from work treated in accelerated-type salt baths required more than ordinary washing in heated alkaline cleaning solutions. Lodgement of salt in threads, keyways, centers, cotter-pin holes, undercuts, blind holes and other voids or crevices required further treatment, such as tumbling, brushing, acid dip and blasting methods to remove the deposit. Barium- and calcium-type accelerators were known to cause this trouble. By research, manufacturers finally developed bath compositions incorporating accelerators or activators readily soluble in hot-cleaning solutions, but effective in preventing cyanide breakdown at carburizing temperatures up to 1650 F. Above this operating temperature, barium-activated baths, though presenting somewhat of a cleaning problem, are still used where trouble-proof carburizing must be obtained.

Advantages of Salt Baths

Advantages derived from liquid carburizing outweigh the disadvantages. Because of its even heating characteristics, the method is unexcelled for producing uniform carburized cases, light or medium in depth, all over intricately shaped parts, where even small difference in case depth cannot be permitted. Work comes from the operation scale-free and in many instances relatively bright, depending upon the composition of the bath used. Distortion of parts is found to be generally less than from other methods of carburizing. This condition is again traceable to the more even heat absorption of the parts. Martempering, a recently developed heat-treating process that reduces crackage and distortion on hardening, is especially adaptable to the liquid carburizing process.

Other advantages, besides those enumerated so far, are: (1) parts can be direct quenched into either oil or water, (2) in batch installations particularly, different case depths can be produced simultaneously by the simple expedient of lengthening the immersion periods, (3) no soot problem is encountered, and (4) the process can be made entirely independent of fuel-gas shortages by heating with electricity. Rapid progress made during the last 15 years in the development of the immersed-electrode principle has stimulated installations of liquid salt-bath furnaces. For a period of several years there was no serious competition from other casehardening processes, especially for light case work, until the carbonitriding process, also known as dry-cyaniding or liquid cyaniding, was again revived.





Fixtures for salt-bath carburizing may be cast (Standard Alloy Co.) or made entirely from rolled or drawn sections welded together (Michigan Steel Casting Co.) Manufacturers supply cast or fabricated fixtures as required

Disadvantages

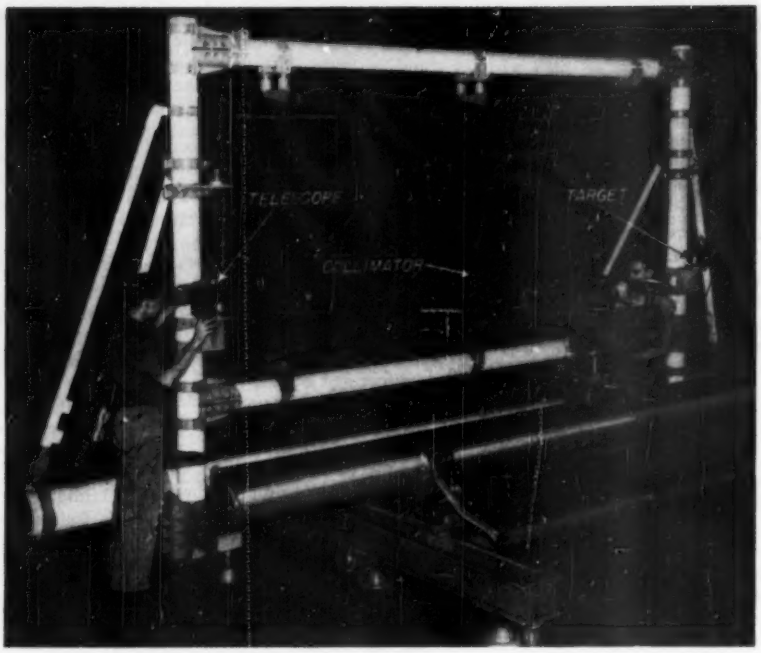
Under disadvantages involved with liquid carburizing, the hazard aspect can rightfully be included. Hardly anyone who has used the process needs any precautionary instructions or suggestions concerning the dangers of charging workpieces containing moisture. Laxity in taking such precaution can result in serious splashing and even explosion of molten salt, causing painful burning of the skin. Goggles should be worn at all times by furnace operators to prevent eye injury. Fumes should be vented.

Cyanides are deadly poisons. Every care should be taken, so that even minute portions are not consumed accidentally, such as might occur from contaminating the hands with the salt and not washing thoroughly. There is the ever-present danger of mixing the salt with acids such as sulphuric, hydrochloric or nitric. In storage, it is a good plan always to keep cyanide-containing salts separate from acids in case of fire, explosion or other such unforeseen occurrences, because where mixing could take place to form deadly hydrocyanic gas. Do not add nitrate or nitrite salts to those containing cyanides because of the danger of explosion.

Liquid carburizing requires making constant salt additions. This requires that this supply item be kept on hand. In large-scale operation, the storage problem is introduced. Carburizing salt is by no means cheap, and salt additions that must be made for bath control, dragout replenishment and sludge waste in a year can run up to a sizeable sum of money.

Another disadvantage where a wide variety of workpieces is to be treated, comes from the large assortment of different types of fixtures that are used to load the bath effectively. If proper fixtures are not provided, considerable expensive hand wiring must be done if work baskets cannot be used.

Another installation of "Good Carburizing Practice" will be published in an early number.



Optical tooling equipment in combination with "knockdown" fixture, saves up to 40% of fixture erection time. Basic structure consists of pipe assembled with bolted standard castings. Fixture fittings are located by adjusting universal positioning tool until collimator on beam is exactly in line of sight between telescope and and target reticle

NEW SYSTEM CUTS AIRFRAME TOOLING

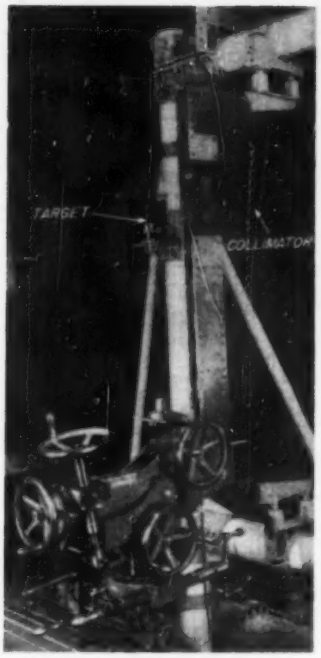
Adaptable to other industries, the new method saves time, permits interchangeability of fixture parts and erection to close tolerances by unskilled manpower after short training period

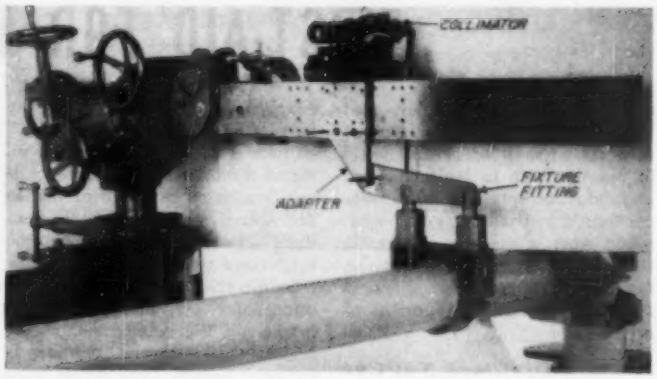
Savings up to 40% in the time required to erect aircraft assembly fixtures are expected from a new system of tooling recently announced by Republic Aviation Corporation (AM—Nov. 27 '50, p 142). Developed during a Phase One project under direction of the Air Materiel Command, the new system employs "knockdown" fixtures that permit interchangeability of fixture parts, optical tooling instruments that establish a beam of light as the reference line from which all fixture fittings are located, and a universal positioning tool that has been specially designed to bring the fixture fittings into accurate relation with the light beam. Dimensions can be held within ±0.0015 in. in 50 ft for horizontal and vertical displacement and within 6 sec angular displacement.

Knockdown fixtures consist of pipe assembled with bolted castings that can be standardized both as to type and size. Welding is eliminated.

Optical tooling instruments provide a collimation or reference line for the fixture. This is the line of sight between an alignment telescope and a target reticle on opposite ends of the fixture. Both instruments are Taylor-Hobson units which are in exact axial alignment when crosshairs in both instruments are matched (AM—Mar. 2 '44, p 109). In the new tooling system, a major advance over previous optical methods is a method of mounting the instruments so alignment can be obtained more rapidly than formerly was possible and without the aid of highly skilled mechanics.

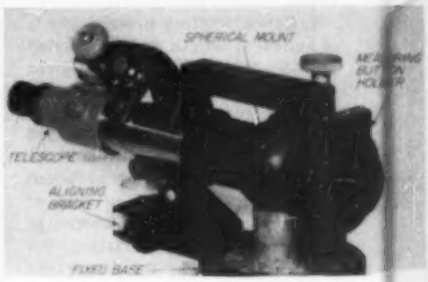
A spherical mount supports each instrument and provides a universal pivot point for alignment. The line of sight of the telescope passes through the center of the sphere and the nodal point of the reticle is coincident with the center of the sphere. After the main fixture assembly is leveled, the telescope, which is mounted on a fixed base, is leveled and sighted on the illuminated target reticle. The target then is lined up with the telescope by means of the vertical adjustment of its adjustable mounting base and of the aligning brackets on the telescope and the target reticle.





Universal positioning tool establishes specific dimensional relationship between collimator centerline and adapter mounting holes. Cerro-alloy is poured into cups to anchor fitting. Positioner provides horizontal, vertical, and tilt adjustment for beam, so simple or compound angles can be set in any plane

Vertical position of beam is employed for upper fixture fittings. Instruments are transferred to upper shelves to establish second line of sight at predetermined spacing from basic line. When collimator is in line, fitting is in correct relation to all other fittings



Alignment telescope rests in spherical mount supported by fixed base in adjustable aligning bracket. After alignment, adjusting screws are locked and level is removed

TIME 40%

The universal positioning tool is a major feature of the new system and was designed specifically for relating the fixture fittings quickly and accurately to the basic collimation line. The beam of the positioner is an accurately machined member on which a Taylor-Hobson collimator can be mounted and to which an adapter can be attached. The adapter mounting holes are in specific dimensional relationship to the collimator centerline. The adapter, therefore, must be accurately made so, when mounted on the beam, the distance from the axis of the collimator to the matching point of the fitting is exactly the dimension specified between the basic collimation line and the matching point. The positioner then is adjusted until the collimator is exactly in line with the telescope and at the correct linear distance from it, as determined by a measuring rod between measuring buttons on the telescope and collimator mounts. The fitting then is exactly located and Cerro-alloy can be poured.

A second collimation line is established for fittings in the upper position. A spacing bar is employed to locate adjustable mounting bases at a predetermined distance from the basic collimation line. Instruments then are transferred to the upper positions, a second collimation line is established, and fittings are located from the upper collimation line by swinging the beam of the positioner into the vertical position. By employing an optical square in place of the collimator on the positioner beam, a line of sight can be projected in any plane normal to any collimation line.

Location of the collimation lines is determined by the tool designer in relation to reference and water lines. Location of the instrument shelves and of the fixture fitting supports need be only to scale dimensions, as final location is obtained through adjustments.

Other advantages of particular value to emergency mobilization are: large fixtures can be transported by air in small units; stock piling in despersed areas is practicable; comparatively unskilled manpower can be trained rapidly in this system of erection; fixtures can be made to dimensional accuracy that will provide interchangeability wihout masters for coordination; with a standard system, know-how can be transferred readily from airframe manufacturers to shops without previous experience in the aircraft field.

Comparative tests on a six-fitting fixture show a total fabrication and setup time of 69 hr for the new system as compared to 115 hr for the conventional welded fixture. Savings of 36.5 hr were realized in the manufacture and assembly of detail parts and 9.5 hr in the installation and alignment of fittings.

FIRST-AID FOR TEN CUTTING-

TROUBLE will be experienced with even the best designed dies. As a result of several years of practice both in toolrooms and in production jobs, I wish to offer condensed instructions about what to do when a die goes wrong. In this article only correctly designed, but wrongly built or used ones are considered. These conditions are:

A . . . Die Does Not Cut

1. See if tool assembly is correct. In symmetrical, or almost symmetrical, blanking dies it is easy to assemble the die in reversed position.

2. Check whether press stroke is of sufficient length and of corrrect location, Fig. 1. Lowest position of ram may not be sufficient to sever the slug from the strip.

It is not necessary for the punch to pass completely through the stock; but it must make sufficient penetration to sever the slug or blank from the strip. Percentage of penetration is variable; the thicker the stock, the lower the penetration percentage necessary. In case of punches with smaller cutting points than the body, do not permit excessive penetration in the die opening; the die can easily be damaged by contact of the punch body.

B . . . Stock Is Not Stripped Off the Punch

Press ram does not rise to correct upper position. See Fig. 2.

C . . . Defects A and B Occur Simultaneously

1. Press-ram stroke is too short.

2. Excessive space between stripper and die proper; stock-guides are too thick.

D . . . Excessive Power Is Required

1. Cutting edges are dull; the cutting pressure increases tremendously.

2. Too little clearance is present between punch and die opening. Minimum pressure occurs when over-all clearance corresponds to 20% of stock thickness, but this exaggerated value produces heavy burrs. The correct clearance, Fig 3, is between 5-8%, depending on metal. Test of correct clearance is appearance of cut edge of blanks and openings: approximately one-third of said surface must be bright and two-thirds opaque.

3. Incorrect alignment between punch and corresponding opening in the die, Fig. 4. One side of the blanks has a burr, the other side is entirely bright. This defect may occur also during the run; a correctly aligned punch or die may shift slightly from position, because of press vibration.

4. Opening in the die is bell-mouthed, Fig. 5. In this case—even with correct clearance and alignment—the blank side surfaces are wholly bright, because of the burnishing effect of the die opening. Remedy: elimination of the undercut in the die opening by means of grinding.

5. Holes in the die proper fill with slugs. Before a hole is completely filled with slugs, the increase in cutting pressure is easily detected.

There are several causes for holes filling with slugs:

(a) The press-bed or bolster has no corresponding hole, and hence the slugs cannot get away from the die. Remedy: put the die upon parallels, to create an opening under the die, Fig. 6. Don't forget to check operation of the die from time to time, to see if the slugs are freeing themselves.

(b) The toolmaker has forgotten to open clearance holes in the die base to allow escape of the slugs. This happens more often than it should.

(c) The necessary slug holes are present in the die-holder base, Fig. 7, or bolster, Fig. 8, but these holes are either of insufficient size or in incorrect position.

(d) Erroneous form of hole in the die proper. The only correct form of hole is shown in Fig. 9. Frequently committed errors in hole section are shown in Figs. 10 to 13, as follows:

Fig. 10—Bellmouthed.

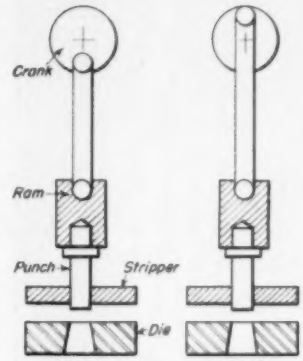
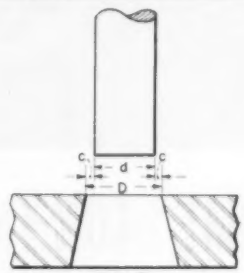


FIG. 1 FIG. 2



D=d+2c FIG. 3

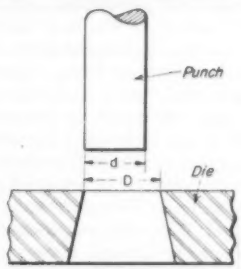


FIG. 4

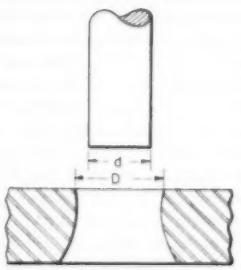


FIG. 5

DIE TROUBLES

BY FEDERICO STRASSER
SANTIAGO DE CHILE

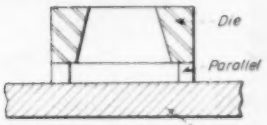


FIG. 6

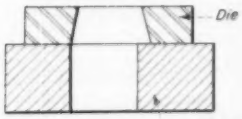


FIG. 7

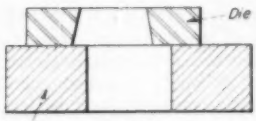


FIG. 8

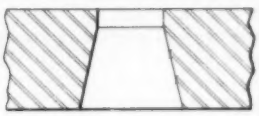


FIG. 9

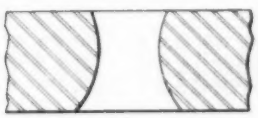


FIG. 10

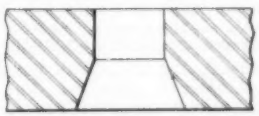


FIG. 11

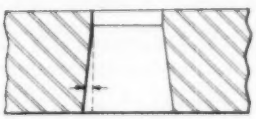


FIG. 12

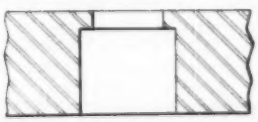


FIG. 13

Fig. 11—Parallel portion too long (it should not exceed 3/16 in.).

Fig. 12—Too little draft in the tapered part.

Fig. 13—The relieved part of the opening is parallel, instead of tapered.

(e) Hole opening surfaces are too rough. In the case of soft stock (copper, brass, aluminum, etc.) it is important that these surfaces be smooth (possibly ground and even lapped).

(f) Small punches. When the perimeter (length of cutting edge) of a punch is too great with respect to the blank area, difficulties are always experienced. This is true because small slugs expand proportionally more than large ones, and tend to clog the die opening. There are several remedies: (1) increase clearance between punch and die opening; (2) increase taper and/or decrease length of parallel part of the die opening; (3) use special forms of punch point, Figs. 14 to 19.

E . . . *Blanks Have Burrs*

1. Excessive clearance. Correct the condition by peening the die opening or the punch, or both. In very severe cases remake one of the members.

2. Incorrect alignment between punch and die opening.

3. Punch axis not parallel to die-opening axis, Fig. 20. Remedy: correct punch position or put shims under the die, as may be the case.

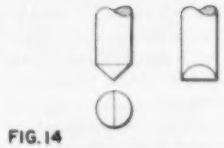
4. Broken die. Make a strong die bed that holds together sectional die parts, Fig. 21.

F . . . *Blanks Adhere to Punch*

This trouble occurs often when small blanks are abundantly lubricated and die openings have little or no parallel portions. Remedy: Provide punch with an ejector actuated by a light spring, Fig. 22.

G . . . *Too Much Play Between Stock-Guides*

In the case of simple blanking dies this fault is of little conse-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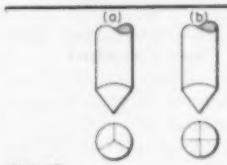

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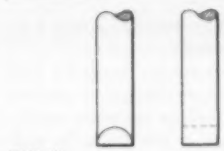
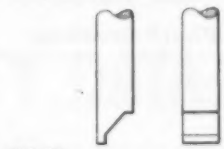


FIG. 16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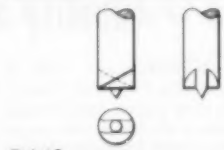
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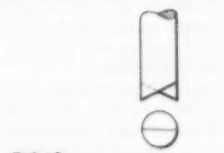
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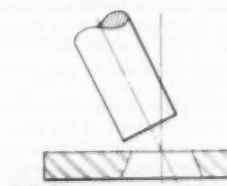


FIG. 20

quence, but in a progressive die it is not permissible, because the blanks will have incorrectly located holes punched in them. Remedy: When stock has practically no width variation, close the opening between the stock-guides. If strips are sheared from sheet and stock width varies, make one of the stock-guides stationary, and the other movable and actuated by a proper spring arrangement.

H . . . Stock-Guides Are Not Parallel

The axis of the piercing and blanking hole centers in any progressive die must be exactly parallel to both stock-guides. If not, the same results will occur as in Condition G.

I . . . Stop Incorrectly Located

In case of simple blanking dies the only consequence is a smaller or greater bridge between blanking openings in the stock. In progressive dies, the blanks will have improperly located holes in them.

J . . . Punch Breakage

There are several causes for punch breakage:

1. Incorrect heat treatment.

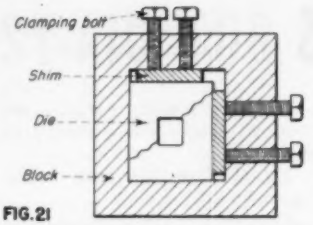


FIG. 21

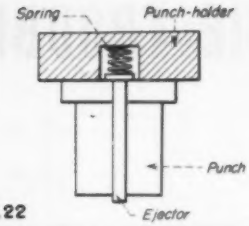


FIG. 22

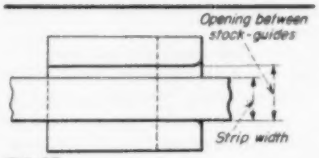


FIG. 23

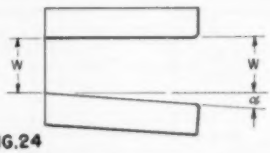


FIG. 24

2. Half-cut or twice-cut holes. Punches should always cut with their entire perimeters; if not, they bend towards the side where they don't cut and often break.

3. Errors in die design that cause filling of die holes with slugs.

4. Incorrectly machined stripper. If the bottom surface is rough and uneven, or if stock guides are not of even height, the punch is stressed in bending.

5. Lack of lubrication. If punch is snugly guided in the stripper, it must be lubricated. If not, there is the danger of clogging and consequent breakage of the punch.

6. Wrongly polished punches. Punches must be polished lengthwise in order to avoid annular machining marks.

7. Punch shank is located incorrectly. In case of a large number of punches, the punch shank must be situated exactly in the "center of gravity of cut." If not, there is a tendency to bend some punches.

Quality Charts Boost Worker Interest

"QUALITY CONTROL is . . . one of the most powerful tools for Human Engineering that I have come across in many years of industrial experience." This was brought out by Roscoe Smith, director of quality control, Ford Motor Co., in a talk presented at the Annual Fall Conference of The Society for the Advancement of Management.

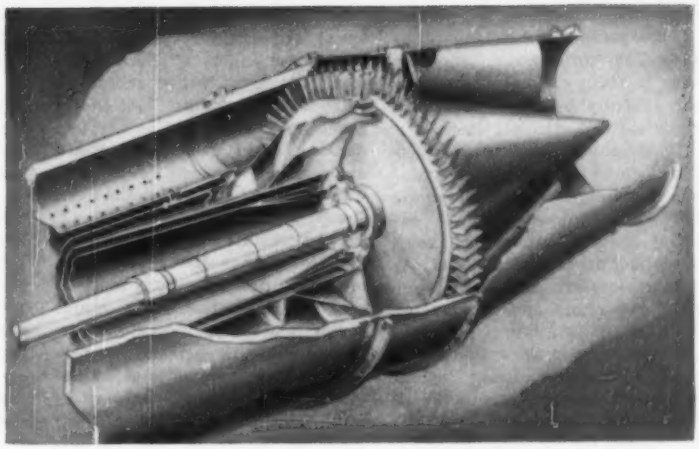
"By the use of Chart Control our people know where they stand in relation to the job they are doing. Uncertainty and misunderstanding, as well as scrap, have been eliminated. Pride and a feeling of security have taken their place. Now our workers have a score card on their performance. Their job becomes a challenge instead of a chore.

". . . Before chart control was introduced a man went along for days and weeks, maybe months, turning out the same identical part. His work was inspected. Some of his output was accepted and some was rejected. He didn't know whether the rejections were his fault, or whether the fault of the machine or the material. He didn't know how this output compared in quality to that of the man across the aisle. In other words, he didn't know the score. And since he didn't know the score, how could he possibly have any real interest in his performance?

"But put a score card on that man's activity and watch the difference!! . . . When his chart shows the quality of his job going out of control he knows it's time to do something about it. He feels it's up to him to improve it. He gets a kick out of tackling his own problems and suggesting from his own experience what can be done to make the job better. Instead of just working eight hours a day at a monotonous job he is striving eight hours a day for self improvement. His morale rises with the challenge and he has reason for his enthusiasm.

". . . One of the finest assets a company can have is an all-round healthy spirit of cooperation. That makes me think about the feuds we used to have between inspection and production people. These functions were often in opposition. And for this reason. On one hand there was a production schedule to be met and on the other a quality level to be maintained. Generally speaking, there was a time lag between detection of poor workmanship at inspection and its correction at the point of manufacture. As a result, production schedules might suffer—quality go down—and blood pressures up.

"But all this has changed. Chart control brings the inspection function right to the production machine. Hour by hour the production men know the quality of their products. Scrap and rework are reduced. Schedules are easier to maintain. Production and inspection work together as a team."



JET ENGINE

Major applications of the alloys discussed in this Report are found in these jet-engine parts: turbine rotor and shaft, combustion chamber, jet exhaust nozzle, and part of the nozzle diaphragm. These alloys include precision-cast cobalt, forged S-816 or Inconel X, and stainless steels, all of which are admittedly difficult to machine

AIR FORCE }
CURTISS-WRIGHT } REPORT

MACHINABILITY DATA FOR HIGH-TEMPERATURE ALLOYS

BY RUPERT LE GRAND, ASSOCIATE EDITOR

Machining variables are especially critical with the jet-engine alloys. Knowledge of optimum feeds and speeds will be essential in order to obtain acceptable production rates and tool life, especially as the procurement program expands. Timely data have been published on this subject by the Curtiss-Wright Corporation.

Material on the following pages is a portion of the results of a $100,000 machinability-research project handled for the United States Air Force. As an aspect of mobilization planning, the purpose of the project is to lay the groundwork for achieving maximum production at minimum cost.

Prime and sub-contractors for jet engines will find the machinability data on the high-temperature alloys to be valuable aids in planning tooling, choosing equipment, and setting up machining cycles. More effective use of machinery, floor-space and available labor may be predicted.

For similar information on SAE steels and irons, refer to the Special Report "Machinability Depends on Microstructure" (AM—Nov. 27, 1950, p 109).

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How Machinability of Jet Engine Alloys Was Appraised

TURBINE-BUCKET alloys present the greatest machining problem. The turbine-rim, or disk, alloy is about midway in machining difficulty between the bucket materials and stainless steels.

Dynamometer cutting tests disclosed three reasons for machining difficulty: (1) high shear strength during cutting, (2) capacity for a high degree of work hardening during cutting, and (3) microstructures resulting from work hardening and precipitated carbides are abrasive.

Tool-life tests show that feeds, speeds, grade of cutting carbide and material microstructure are all critical. The table compares cutting speeds for six materials at 30-cu in. tool life and 0.008-in. wear.

Material	Heat Treatment	Cutting Speed fpm
S-816	Sol. Treated	35
Inconel X	" "	50
Timken 16-25-6	Stress Rel'd	350
AISI 347	Annealed	550
AISI 4340	300 Brinell	600
AISI 410	306 Brinell	800
AISI 410	204 Brinell	850

In making the tests, variable-speed lathes used carbide tools with these angles. 0° BR, 6° SR, 0° SCEA, 6° ECEA, 6° relief and 0.020-in. nose radius. Tool life is based on a wear land on the tool flank of 0.016 in. for the S-816 and Inconel X tests, and 0.008 in. wear land for all of the rest, except as noted.

From results of these tests, it is evident that the sequence of manufacturing operations must be planned, if possible, so all major rough machining operations on bucket alloys, particularly, be performed with the material in the solution-treated form. Only minimum stock would be left for grinding. And the best carbide available for the material must be employed at the optimum speeds and feeds.

Properties of Alloys

Four of the six alloys tested are austenitic or austenite-like. Despite their widely varying chemical compositions, they exhibit similar microstructures and physical properties. They retain the same matrix structure over a wide temperature range, therefore hardening cannot be attained in the same manner as for carbon steels. Instead, maximum hardness and strength are procured by a series of heat treatments or mechanical working.

S-816 is essentially 20% chromium, 20% nickel and 40% cobalt.

Inconel X nominally contains 15% chromium and 73% nickel.

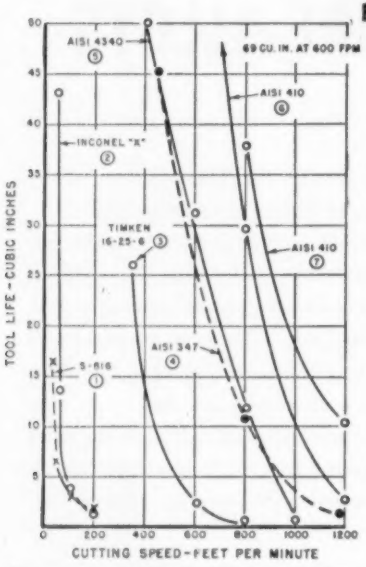
Timken 16-25-6 has equivalent percentages of chromium, nickel and molybdenum.

AISI 347 is an 18% chromium—10% nickel stainless steel consisting of austenite.

AISI 4340 is a high-strength, chrome-nickel-moly steel.

AISI 410 is a 12% chromium stainless, which can be ferritic or martensitic.

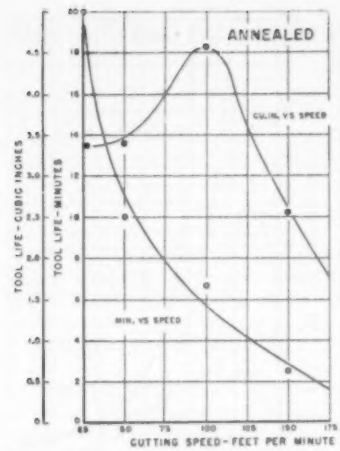
Solution treatment of bucket alloys involves heating at 2100 F or slightly higher to dissolve carbides and form a single solid solution. The quenched solid solution is unstable; carbides precipitate to harden the alloy. Age hardening is accomplished by reheating to 1400 F and holding for 16 hr.



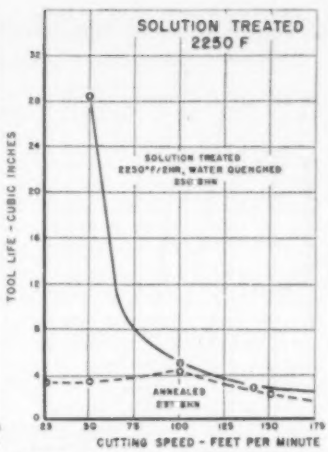
Comparative cutting speeds for six alloys. Feed: 0.009 to 0.011 ipr. Curves 1 and 2 —K6 carbide: curves 3 to 7—K3H carbide

PHYSICAL AND MACHINING PROPERTIES OF JET-ENGINE ALLOYS

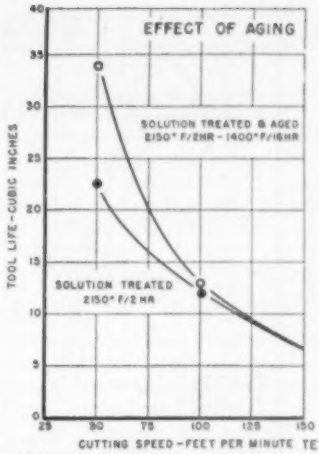
	Brinell Hardness	Meyer Exponent	Coefficient of Friction, Avg.	Cutting Speed	Unit Power, HP/Cu. In./Min.	Shear Strength in Cutting, psi x 1000	Ultimate Tensile Strength psi x 1000 70 °F.	1000 °F.	1500 °F.
S-816									
Annealed, 1930 °F.	297	2.23	0.68	100	1.21	132	....	....	....
Solution treated, 2250 °F.	250	2.28	0.65	100	1.16	130	....	....	....
Solution treated, 2150 °F.	269	2.34	0.62	100	1.22	138	....	....	....
Solution treated, aged, 2150, 1400 °F.	268	2.34	0.69	100	1.20	135	160	122	78
INCONEL "X"									
Solution treated, 2100 °F.	279	2.37	0.68	100	1.30	135	....	....	....
S. T. and aged, 2100, 1550, 1300 °F.	313	2.25	0.66	100	1.26	145	162	140	50
Equalized, 1625 °F.	265	2.21	0.72	100	1.27	135	....	....	....
Equalized, aged, 1625, 1300 °F.	332	2.37	0.68	100	1.38	147	....	....	....
TIMKEN 16-25-6									
Work hardened	318	2.09	0.61	200	1.18	130	148	95	45
Stress relieved, 1300 °F.	274	2.24	0.60	200	1.02	127	....	....	....
Solution treated, 2150 °F.	187	2.17	0.62	200	1.05	115	109	85	43
AISI 347									
Annealed	262	2.08	0.60	200	0.87	109	90	61.5	24
AISI 4340									
300 Brinell	300	2.20	0.68	200	0.94	111	150	....	....
AISI 410									
200 Brinell	204	2.22	0.69	200	0.82	97	89	44.5	9
300 Brinell	305	2.11	0.65	200	0.92	109	....	....	....
SAE 8640									
300 Brinell	302	2.15	0.67	200	0.93	109	150	....	....



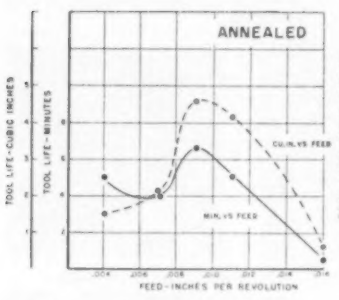
Optimum tool life is obtained on annealed stock at 100 fpm. K2S carbide was used at 0.009 ipr



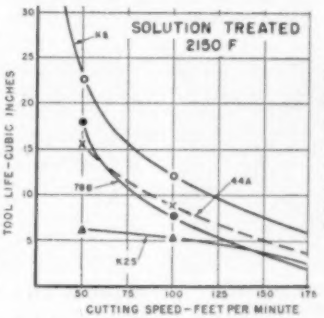
Solution treatment at 2250 F gave a marked increase in tool life at lower cutting speed (K2S)



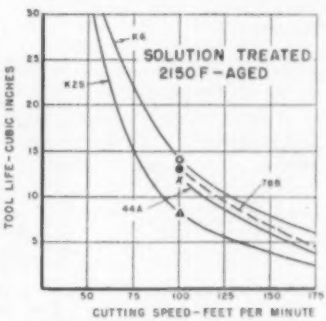
Solution treatment plus aging produced better tool life than solution treatment alone (K6)



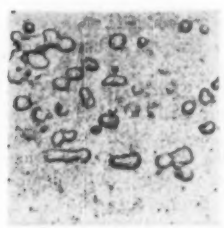
Feed is critical, regardless of heat-treatment. For annealed stock, tool life is best at 0.009 ipr



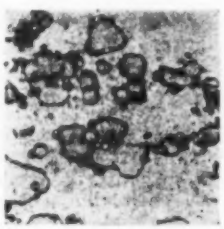
Cast-iron grades of carbide afford best tool life on the solution-treated stock (0.011 ipr)



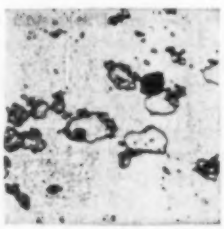
Further improvement in tool life is obtained by aging the solution-treated cobalt alloy



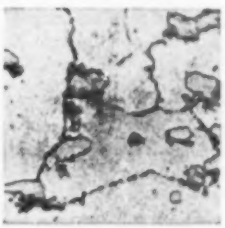
Annealed 1950 F



Solution Treated 2250 F



Solution Treated 2150 F



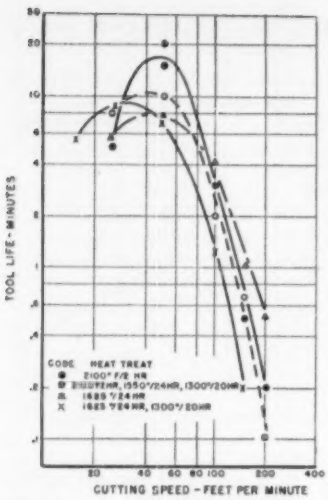
Solution Treated 2150 F—Aged at 1400 F 1000 X

Feed Is Critical in Machining S-816

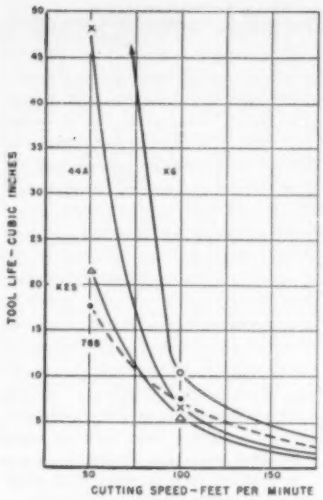
ANNEALED S-816 cobalt alloy machines best at 0.009 ipr at 100 fpm, using K2S steel-cutting grade carbide. Under these conditions, tool life is 4.5 cu in. for 0.016 in. tool wear.

Solution treatment at 2250 F for 2 hr produces a seven-fold increase in stock removal per grind, when the cutting speed is dropped to 50 fpm, and the feed remains at 0.009 ipr. The advantage of solution treatment is slight when machining at 100 fpm.

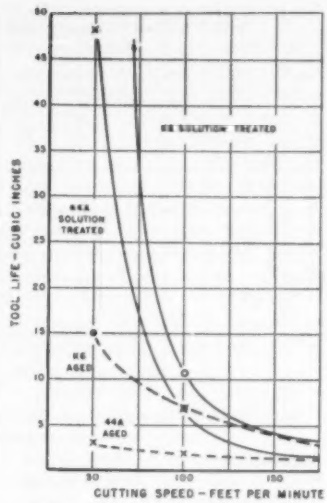
Turbine buckets are normally solution treated at 2150 F for 2 hr and quenched in water. Various grades of carbides were tried on this material, and it was found that the cast-iron cutting grades are superior to the steel grades. Maximum tool life with K6, for example, occurs at a feed of 0.011 ipr.



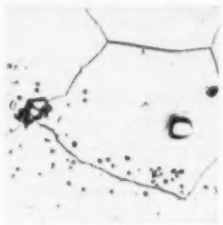
Microstructure of Inconel X critically affects tool life. K3H carbide; feed 0.009 ipr



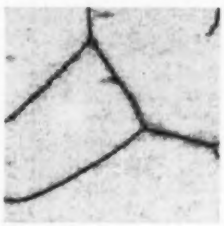
Carbides intended for cast iron give best results on the solution-treated Inconel X



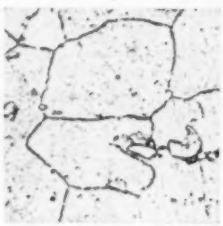
Aging sharply reduces tool life of the nickel alloy. Feed, 0.011 ipr in both examples



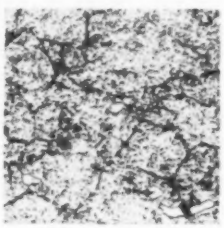
SOLUTION TREATED, 2100 F



SOL. TREATED AND AGED, 2100, 1550 AND 1300 F



EQUALIZED, 1625 F



EQUALIZED AND AGED, 1625 AND 1300 F 500 X

Aging Reduces Machinability of Inconel X

BOTH turbine-bucket alloys, S-816 and Inconel X, give best tool life when machined in the solution-treated state with cast-iron grades of carbides. Feed for both materials should be between 0.008 and 0.014 ipr, because tool life falls off sharply if either limit is exceeded. Optimum cutting speed for both materials in the solution-treated form is about 50 fpm.

Microstructure has an important bearing on tool life. Inconel X solution-treated at 2100 F has a solid-solution matrix with scattered carbides in banded form. Aging of the material at 1530 and 1300 F for long periods precipitates carbides to darken the matrix. If equalized at 1625 F the microstructure depicts solid-solution matrix with banded complex carbides and smaller grains. Aging the equalized structure at temperature of 1300 F for 20 hr precipitates and further disperses the carbides.

Tool wear on Inconel X is not as rapid as on S-816. When steel-cutting carbide K2S was run dry on S-816, at 50 fpm and 0.009 ipr, the resulting tool life was 17 min. or 6.5 cu in. for wear land of 0.016 in. For Inconel X at a feed of 0.011 ipr and 50 fpm, the tool life was 60 min. and the stock removal 22 cu in.

Grade of carbide is important in machining Inconel X. Like the S-816 cobalt alloy, the nickel alloy is machined best with cast-iron grades of carbide such as K6 and 44A. At 50 fpm, these carbides have at least a two-to-one advantage over steel-cutting grades.

Solution-treated stock gives up to ten times the tool life of the aged material, other conditions being equal. As solution treating is necessary in the hardening of Inconel X, it appears desirable to machine parts close to the final size in this condition before aging takes place. A minimum of stock would then be left for grinding after aging.

Tests were run at elevated temperatures (up to 1600 F) to determine whether the reduction in physical properties of the alloy being machined would increase tool life. Apparently the weakening of the carbides offset possible gains.

Because of the cratering and abrasion experienced, the researchers suggested that efforts might be made to develop carbides especially suitable for materials like Inconel X and S-816.

Heat-Treated Timken Alloy Machines Readily

TIMKEN 16-25-6 alloy, while closely related to S-816 and Inconel X in microstructure and properties, is seldom heat treated in its present application for turbine disks. This situation probably arises because superior properties are attainable through work hardening. Nevertheless, tests were conducted on solution-treated material as well as other forms of Timken alloy for comparative purposes.

In jet-engine service, this alloy operates at temperatures below 1200 F, which is considerably lower than the stress-relieving temperature. If the operating temperature became too high, work hardening would be valueless, because the material would be stress relieved.

Work hardening deforms and distorts the material to such an extent that machining before this step is not feasible for buckets. But machinability of the stress-relieved or solution-treated alloy is so superior to that of the work-hardened material that industry may find applications where rough machining can be performed in one of these conditions. In such cases, important economies will be secured by the practices.

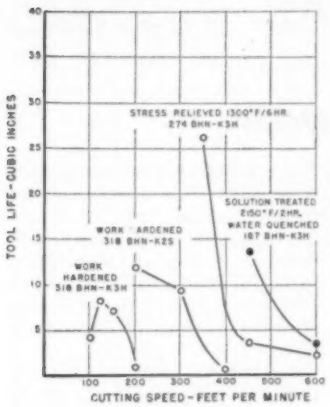
In machining the Timken alloy, tool life improves considerably from the work-hardened to the stress-relieved condition and even further when the metal is solution treated. As much as three times the tool life was obtained at a constant cutting speed with the solution-treated form as compared to work-hardened alloy. In fact, solution-treated Timken alloy can be machined with K3H carbide ten times as fast as solution-treated S-816, at half the wear land for equivalent stock removal and feed. This observation is based on a feed of 0.010 ipr in both cases and cutting speeds of 500 and 50 fpm, respectively.

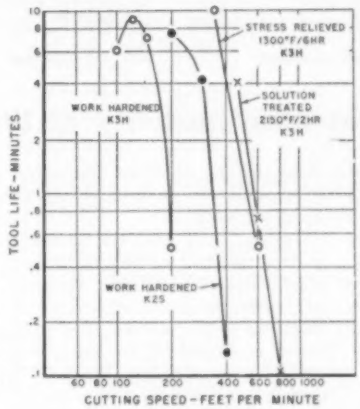
Most of the tests on Timken alloy were made with K3H carbide, but K2S was found to give better results where it was tried. It is possible that one of the other existing carbides may provide greater tool life, but such tests were not carried out.

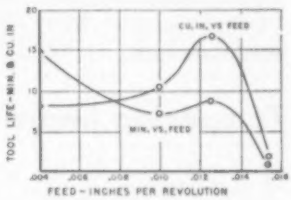
Generally speaking, the machining of Timken alloy, as used for the turbine disk, does not present the problems encountered with the bucket alloys. Fair tool life is obtainable at cutting speeds up to at least 300 fpm.

The effect of feed on tool life at a constant cutting speed of 200 fpm was investigated, using K2S carbide. As with the bucket alloys, best tool life was obtained in the range between 0.011 and 0.014 ipr.

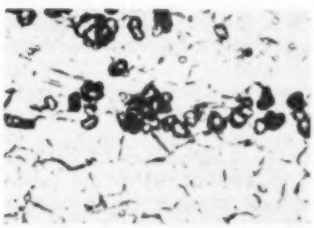
Drilling of Timken alloy is an important operation in the manufacture of turbine disks. High-speed-steel drills are used. Turn to page 105 for a discussion of this subject.


TOOL LIFE - CUBIC INCHES
STRESS RELIEVED 1300°F/6HR. 274 BHN-K3H
SOLUTION TREATED 2150°F/2HR. WATER QUENCHED 187 BHN-K3H
WORK HARDENED 318 BHN-K2S
WORK HARDENED 318 BHN-K3H
CUTTING SPEED - FEET PER MINUTE

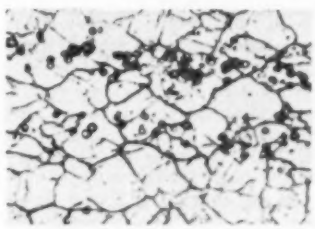

TOOL LIFE - MINUTES
STRESS RELIEVED 1300°F/6HR K3H
SOLUTION TREATED 2150°F/2HR K3H
WORK HARDENED K3H
WORK HARDENED K2S
CUTTING SPEED - FEET PER MINUTE



Solution treatment gives the best structure for machining. K2S carbide is superior to K3H in tests made at 0.010 ipr (left and center). Optimum feed (above) for Timken alloy is about 0.013 ipr when cutting work-hardened material at 200 fpm. Wear land in all cases, 0.008 in.

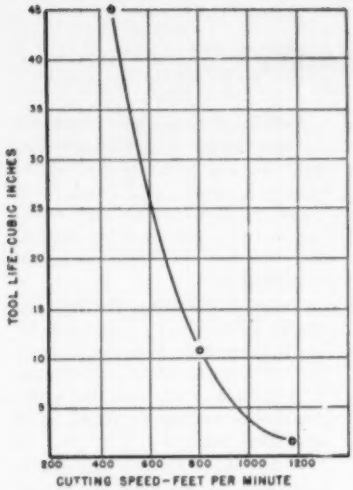


WORK HARDENED

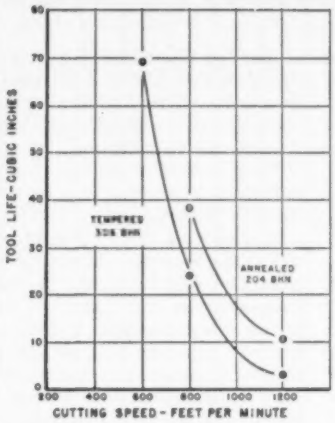


STRESS RELIEVED

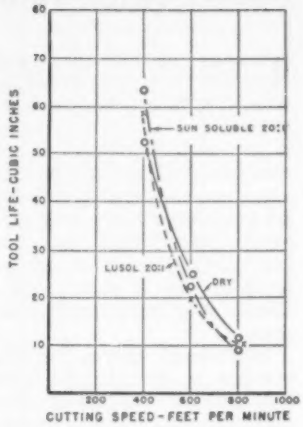
SOLUTION TREATED 1000 X



Acceptable tool life on annealed 347 stainless is obtainable at speeds up to 400 fpm with K3H carbide

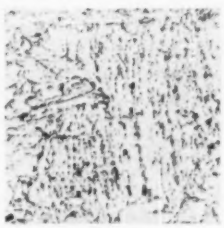


Tempered 410 stainless is the most machinable jet-engine alloy. Feed rate employed, 0.010 ipr

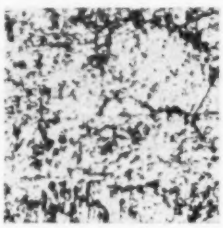


Coolant adversely affects tool life when cutting tempered 4340 at speeds above 600 fpm

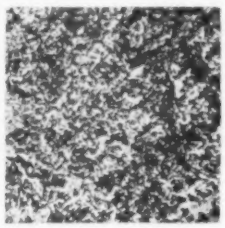
AISI 347—ANNEALED



AISI 410—ANNEALED



AISI 410—TEMPERED



AISI 4340—TEMPERED 500 X

Tempering Improves Machinability of Stainless

TURNING tests on the three remaining alloys, AISI 347 and 410 stainless steels and AISI 4340 steel, revealed that these materials machined with far greater facility than the previously described alloys. Microstructures of these materials are:

Annealed stainless:
347—austenite plus carbides
410—ferrite plus carbides
Tempered stainless:
410—martensite plus carbides
Tempered 4340—martensite

The presence of ferrite in annealed AISI 410 is helpful in improving its machinability. At 800 fpm and 0.010 ipr, the annealed AISI 410 machines almost as well as annealed AISI 347 at 400 fpm and the same feed rate. And when both materials are machined at 800 fpm, over three times as much chips can be obtained per grind from AISI 410 as from AISI 347 annealed stock.

Tempering of AISI 410 produces a structure that proved to be the most machinable of any alloy used in jet-engine manufacture. At a hardness of 300 Brinell, this material is employed for the compressor and the blades. When K3H carbide was employed to cut tempered AISI 410, a cutting speed of 600 fpm produced a tool life of 70 cu in., or 15 min. These values were approximately three times greater than obtainable on annealed AISI 347. In other words, it is certainly possible, and perhaps practical, to machine tempered AISI 410 at speeds up to 600 fpm with a feed rate of 0.010 ipr.

In the case of AISI 4340, tempering to 270 Brinell produces a martensitic structure. However, at 600 fpm and 0.010 ipr, the tool life is only one-third as much as for tempered AISI 410. To obtain reasonably good tool life with this material, it thus appears essential to stay within a cutting speed of 400 fpm. Tool-life characteristics of 4340 are closely similar to those of annealed 347 stainless.

Tests on AISI 4340 included cutting dry and with two types of water-soluble cutting fluids. It was found that coolant improved tool life at 400 fpm. At higher speeds, cutting fluid proved to be detrimental to tool life. In fact, at all speeds there was noticeable danger to the tool when using soluble-oil mixtures. When the chip got out of control, a momentary interruption in the flow of the coolant to the tool tip resulted in immediate cracking of the carbide. Thermal fracture arose from overheating.

How Timken Alloy Behaves in Drilling

BECAUSE of the necessity of putting jet-engine manufacture on a high-production basis, the problem of drilling Timken alloy 16-25-6, used in the gas-turbine disk, has become important. Preliminary findings indicate that a reasonable drill life of say 18 in. between grinds can only be attained at feeds less than 0.010 ipr and speeds less than 18 fpm. Helix angles greater than the common 28° promise to give better results. Pilot holes result in lowered drill life. Clearance angles commonly used on standard drills seem far too great. And there is a strong indication that the temperature in vicinity of cutting may prove a quick method of evaluating the effect of cutting fluids on tool life.

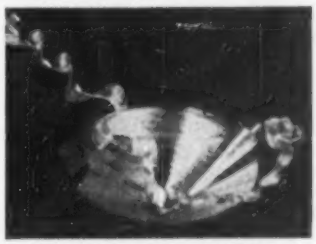
Tests performed on Timken alloy were made with 9/16-in. drills of the molybdenum, 18-4-2, and cobalt high-speed steels. A 12° lip clearance angle and a 118° point angle were standard. Variables investigated were: speed, feed, helix angle, drill material, drill section, effect of pilot hole, torque, thrust and drill life.

Drill Life—For speeds at which a reasonable tool life is obtainable, there is a fairly well-defined feed. If this value of feed is exceeded, a rapid decrease in life follows. On the other hand, dropping back from a suitable feed greatly increases the number of inches of stock removed per drill grind. At 20 in. of drilling, for example, drilling of the alloy might be accomplished at 41 fpm and 0.005 ipr, or 18 fpm and 0.009 ipr, but in the first case metal would be removed about 20% faster.

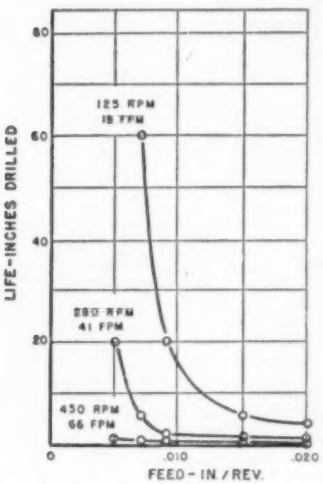
Helix Angle—The most important angle in any tool is the resultant rake. In a drill, rake is controlled by the helix angle and slightly by the point angle. When special 19° and 38° helix angle drills were used in conjunction with standard 28° helix angle drills, it was found the high helix angle reduced thrust and torque and the life was increased at 0.009 ipr. However, increasing the helix angle decreases the amount of metal supporting the cutting edge. For this reason, the 38° helix angle was unsatisfactory for a heavy feed of 0.020 in. Thus, the higher helix angles merits attention for use at reasonable feed rates, because of longer life and easier chip removal.

Drill Material—Under the fairly severe conditions applied in these

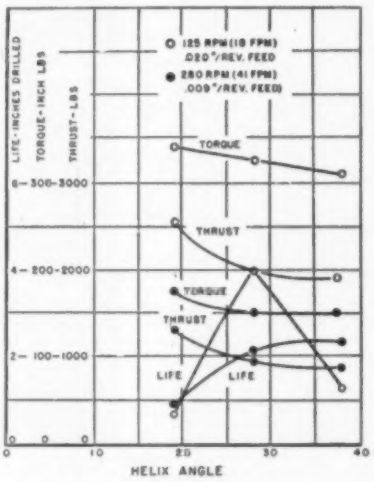
Chip flow in drilling consists of metal removal by plastic shear at the cutting edge and extrusion



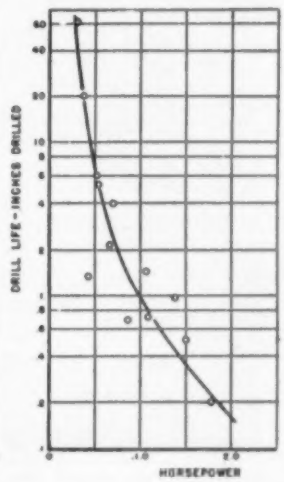
Unlike cutting actions of drill lip and chisel edge are shown. Pilot hole was filled with soft metal. Chisel edge extruded narrow, helical chip, but drill lip cut metal cleanly and curled it tightly



Tool life of 20 in. of drilling, or better, is secured with feeds between 0.005 and 0.009 ipr



Increased helix angles give lower thrusts and torques, greater life at lower feed rate



Horsepower consumed in drilling is correlated with drill life, is proportional to *TN*

tests, standard 18-4-2 drills had a life about 30% greater than the molybdenum high-speed drills, and cobalt high-speed drills were about twice as good. Heavy-duty section drills of molybdenum HSS and with approximately the same web thickness but a different flute section and wide land, were not quite as good as the 18-4-2 standard drills operating in solid metal.

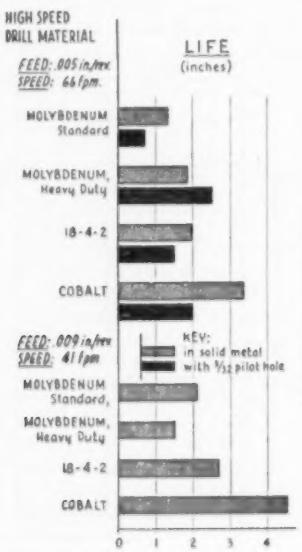
Pilot Holes — When drilling pieces with a pilot hole slightly larger than the length of the chisel edge of the 9/16-in. test drills, torque increased slightly. Thrust was cut in half by use of a pilot hole, indicating that half of the thrust force is due to the chisel edge. Tool life, except in the case of the heavy-duty drill, was decreased by the pilot hole, probably arising from work hardening the metal in pilot-hole drilling.

Drill Forces—Knowledge of drill forces is of value in connection with studies of drill breakage. Larger drills usually fail by wear or chipping of the cutting edge rather than fracture of the drill body. Hence the question of drill forces arose as a measure of drill life. When drill life was plotted against drill torque at several cutting speeds, no correlation was found, except at constant values of speed. Horsepower in drilling is directly proportional to the product of drill torque and speed, according to the formula: $Hp = 1.59 \times 10^{-5}\ TN$, where T is drill torque in in.-lb and N is drill rpm. When horsepower is plotted against drill life, a better correlation is established. Only extensive tests will reveal whether rise in drill thrust with tool wear will prove a reliable indicator of when drills should be changed.

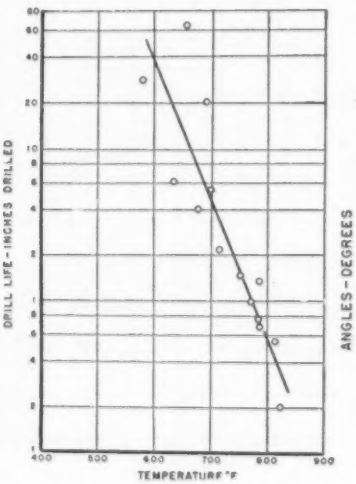
Drill Temperature—The correlation established between drill life and power suggested that drill life may depend on the chip-tool interface temperature (when metal is cut, practically all of the work done is converted into thermal energy). Hence, the mean temperature along the points where the drill and workpiece make contact was measured with a chip-tool thermocouple method.

Probably the temperature at the cutting edge is actually much higher than the measured values. Tests run at various feeds and speeds show that the measured temperature rose to about 850 F at 115 fpm and any feed rate between 0.005 and 0.020 ipr, when cutting dry. At 0.009 ipr and 18 fpm, the temperature was 580 F; at 0.005 ipr and 41 fpm, it was 520 F. By using carbon tetrachloride as a coolant, the temperatures were reduced to 480 and 410 F, respectively, for the above cutting conditions. With other test data available, it was possible to plot a single-line curve, which shows that tool life can be considered a function of temperature, regardless of speed, feed, etc.

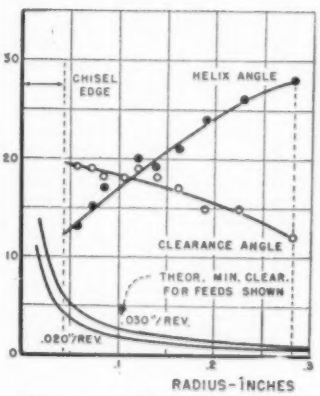
Clearance Angle—Tool life varies inversely with the clearance angle, provided a certain minimum clearance angle is exceeded. This minimum angle is needed to avoid interference with the feed, which would prevent the drill from cutting. In drills, the situation is complicated by the fact that near the center, a larger clearance is required than at the OD. Just what angles are obtained is a function of drill grinding. Tools were ground on a Sellers 1-G machine, replicas made by a casting process, sections cut away and clearance angles measured with a toolmaker's protractor. It is evident from the chart herewith that the actual clearance, which was the least the machine was capable of producing, is more than is needed. A clearance angle of say 5° more than the minimum would be adequate and would result in a stronger cutting edge.



Pilot holes usually adversely affect drill life. Moderate feed and speed improve tool life



Temperature adversely affects drill life, may be sole factor in determining actual wear life



Clearance angles machine ground along cutting edge exceed theoretical minimum for feed rate

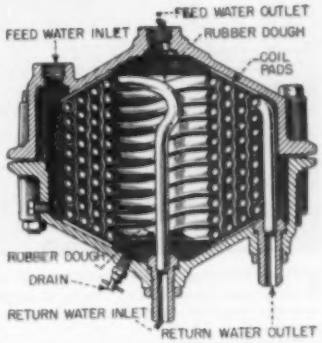
TUBE COILING

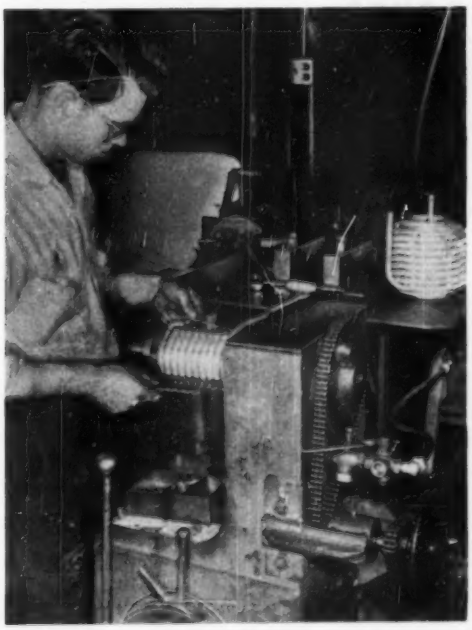
Steam generation in the face of advances by diesel, electric, and internal-combustion power, still has its uses; and these uses are often critical. Just ask a railroad-coach passenger if his car heat isn't critical, or ask a shop superintendent if heat for his assembly rooms isn't necessary. For these uses, Vapor-Clarkson steam generators provide intense, instant-starting, and highly efficient heat. And for steam-heat generation, it is the boiler and heat-exchanger coils that take the heavy beating.

...SMALL COILS FOR HEAT EXCHANGERS

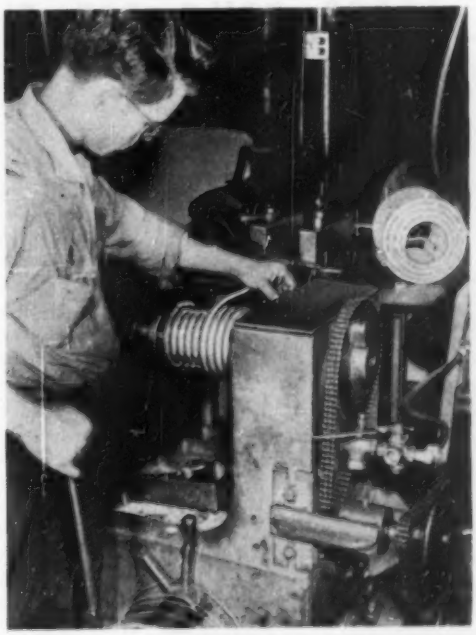
BY JACK MILLER, Coil-Shop Foreman, VAPOR HEATING CORP

HEAT transfer in the small steam-generator coils is a two-way proposition. Warm water returning from the steam separator has to be cooled down, and cool water bound for the feed lines must be preheated. The heat exchange takes place in a copper coil that is 6½ in. high and has a 7-in. OD. Tubing is ½ in. in diameter, has a 0.065-in. wall, and measures 53 ft in length before coiling. Actually, feed water flows around and between the coils, inside the heat-exchanger casing, while return water flows through the tubing itself. Important points in construction of the coils are accurate forming so the coil will fit the casing and all fittings will join correctly, good welding so the coil will stand hydrostatic testing at 150 psi for 5 min., and careful handling to prevent damage to the tubing.

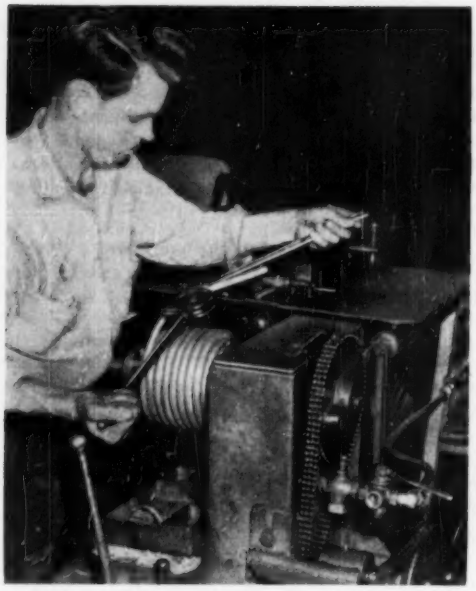




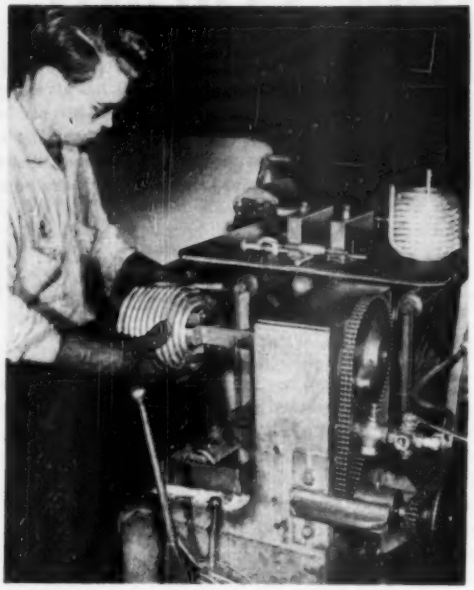
1 Copper tube is coiled on rotating mandrel of lever-controlled machine. Four layers totalling 38 turns are formed at 4 rpm. Air cylinder on table at rear offset-bends tube after each layer is completed



2 Sinuous strips slipped under spring "garter" and first turn of new layer separate and locate the coils. Eight strips in each layer are torch-silver-brazed to tubing to make solid, tough unit

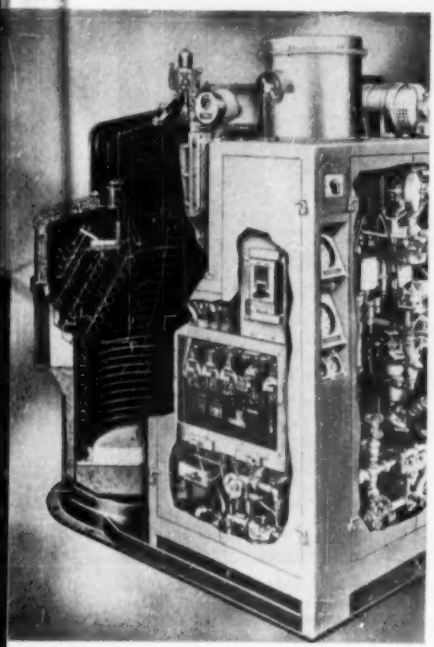


3 **Hand bending tool** makes turns at start and finish of coil, forming inlet and outlet lines parallel to coil axis and flat against outer layer



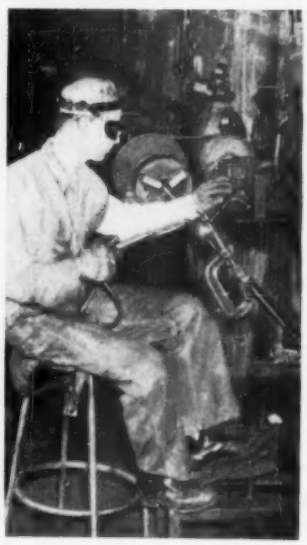
4 **Four shoes** on square machine spindle form mandrel over which coil is formed. Shoes come off with coil, drop out, and are replaced on spindle

...LARGE COILS FOR FIREBOXES

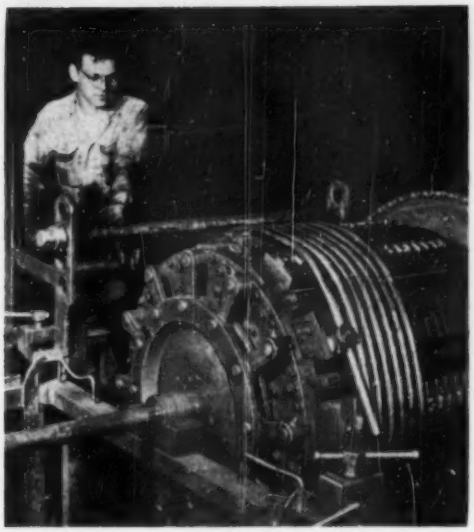


BY WILLIAM C. KEERAN,
VP in Chg of Production,
VAPOR HEATING CORP

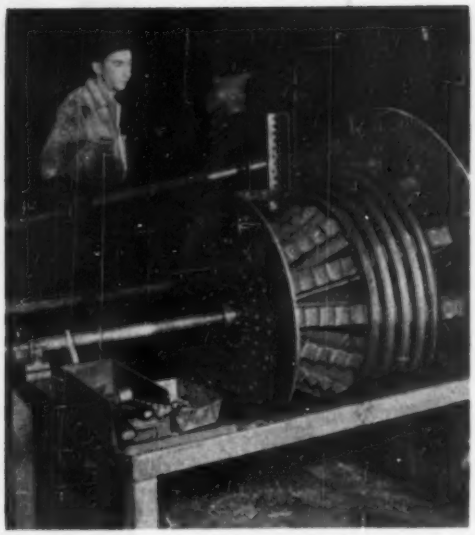
STEAM generation in the firebox coils is simply a matter of heating water to a high temperature in a safe container. Heat release is about a million BTU per cu ft of space, with over 90% of the water turning to steam, and the remainder carrying away sludge to a separator. Automatic control devices are provided, so explosions are impossible. The finished coils are made in any number of layers from one to four, with 15 to 60 turns, and in a large range of sizes. Most coils are formed with ASME A83 tubing, ranging from ½ to 1½ in. in ID. Basic stock is mill lengths of the tubing, from 18 to 24 ft long, which are joined in twos by welding, and then welded into finished lengths, ready for the coiling machine.



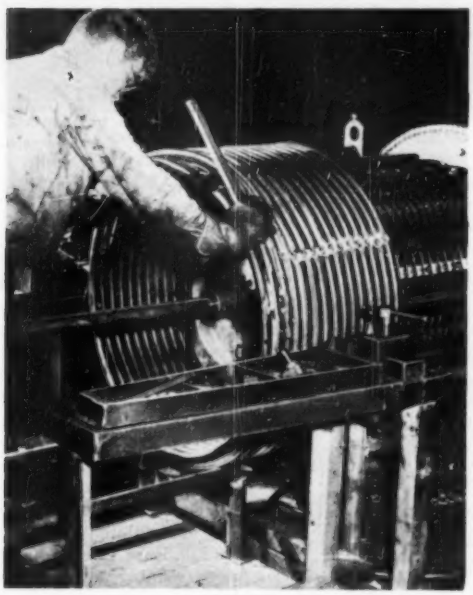
Seamless steel tube is butt-welded after sections are cleaned with carbon tetrachloride and clamped together. Motor-driven chuck is controlled by foot clutch



Coiling fixture is rotated at 2 rpm by 5-hp motor, working through reduction gearbox and chain drive on large faceplate. Crossbar exerts downward pressure on tubing so it follows notches. Radial links from small plate hold form shoes steady during coil cycle. Up to 500 ft of tubing can be coiled this way



Cone-shaped coils are formed on fixture with notched shoes set at an angle. Flat end plate indicates old fixture design, which requires slow disassembly to remove formed coil. Straight coils were formerly made on similar, slow-acting fixtures before collapsing feature was worked out as at left and below

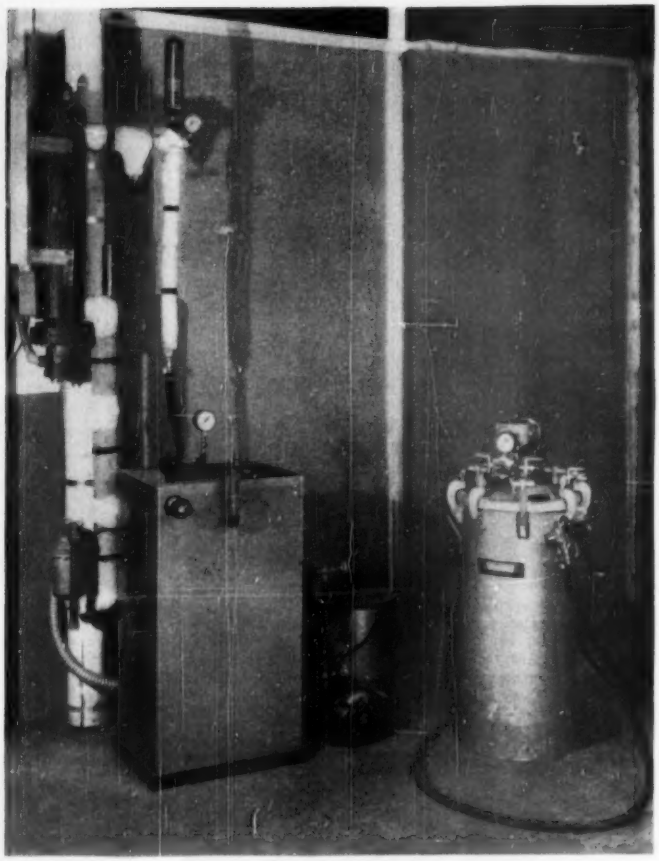


Coiled tubing is removed after tackwelding so coils won't twist. Notched form shoes are retracted when link plate is rotated. Bars are replaceable to change spacing and for 18- or 19-in. coil ID

Coil finishing includes gaging size and spacing, welding fittings in place, stress-relieving at 1100F in car-bottom furnace, hydrostatic-testing at 1200 psi, and coating with rust preventatives

STEAM SPRAYS PAINT

Barely out of the development stage, but showing great promise, is a new method of paint spraying by means of superheated steam



Operating setup for steam spray painting, showing self-contained boiler unit, superheater (upper left), and conventional paint pressure tank

BY H. E. LINSLEY, ASSOCIATE EDITOR

SUBSTITUTION of superheated steam for compressed air for spray painting is one of the latest developments in finishing. The process, patented by du Pont, appears extremely promising, although it is not as yet being used generally in industry.

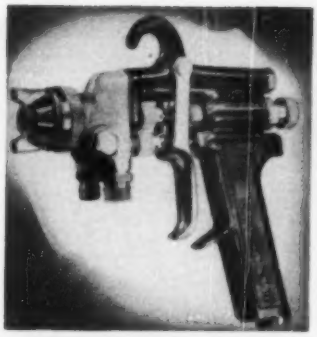
Considerable field research and development work is yet to be done before it can be considered a commercially applicable production process, but results with experimental installations appear to point to substantial economies and some improvement in appearance.

With air as the atomizing medium, usually at 60 to 80 psi, there is considerable loss, which increases with air pressure, so spray efficiency rarely exceeds 65%, and is generally under that. Spray losses occur in two ways: overspray which occurs when the spray fan is projected beyond the edge of the work, and losses in the form of paint particles diverted from the work by the rebounding air stream. Losses from this source are usually greater than those from overspray.

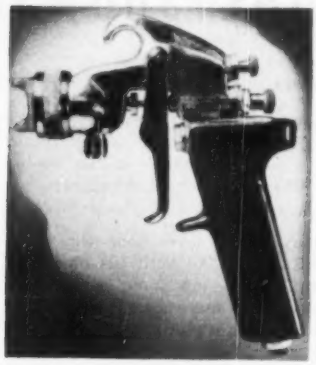
When superheated steam is used, there is immediate dissipation of the velocity energy into the paint and the adjacent atmosphere. There is thus a minimum of turbulence at the surface of the work.

Other advantages are the actual material savings, which may be from 10 to 20%. This will necessarily vary with local conditions and the size and shape of the work. In some cases the film thickness per coat can be increased without causing running or sagging, and the difficulties of pinholing and popping, caused by trapped air, are greatly reduced. Frequently this means that one-coat application is possible, thus eliminating one baking operation, one spray coat and one handling of normal two-coat work. Because of reduced losses, fewer cleanings of the booth are needed.

Basically, steam is cheaper than compressed air, and although this is often a minor item, one user



Special Binks steam spray gun in which steam is brought directly to the head which is insulated from the gun body. Handle and trigger are cool enough to be operated with a bare hand without discomfort



Special DeVilbiss spray gun for use with superheated steam incorporates a bypass arrangement to prevent condensation in the gun when spraying is temporarily interrupted

claims an economy of 15 to 20% in favor of steam. This will, however, vary with individual plants, size of installation, compressor capacity and other factors. But substantial savings can be effected by the reduced quantity of thinner required because it is possible to apply finishes heavy in body and higher in solids. It is not claimed that steam-sprayed finishes are better or glossier, although the orange-peel effect may be reduced, but there is a notable reduction in over-all finishing costs.

Du Pont's experience to date has been confined chiefly to alkyd and alkyd urea formaldehyde paints, as widely used in industry today, but there is every indication that the steam process will be suitable for a great variety of finishes, not necessarily furnished by du Pont.

Equipment costs are relatively low in comparison with the economies attained but, although the principles of operation are comparatively simple, a definite amount of know-how is required in addition to the special equipment. Du Pont will offer the process to industry on a royalty basis, and it is suggested that would-be users do not attempt to put it into use without first obtaining the necessary instruction.

Disadvantages

Among the disadvantages are the fact that the steam source must be located close to the operator to avoid excessive hose length and resultant cooling of the steam; and there must be a constant pressure. Few plants will have a source of superheated steam available with the required pressure and dryness, but special generators have been developed. Livingstone Engineering Co., for example, makes an all-electric, packaged boiler plant which includes an electrically heated 100-psi boiler, feed water pump, motor, controls, and electric superheater. Freedom from open flame permits these Speedy-lectric units to be installed close to the spray booth.

Steam-spray boilers are available in capacities capable of serving from one to eight guns. Larger sizes are available, but the best results appear to be obtained when not more than eight guns are served from one unit. This makes it possible to keep the steam source close to the guns and avoid the danger of condensation in the lines. To insure steam with not over 2% moisture at the nozzle, a separate superheater for each gun is included for installation in the steam line as close to the gun as possible. For best results, pressure at the gun should be about 60 psi, with superheat of at least 10 F. With this, the amount of moisture deposited in the paint film is insignificant.

Steam from existing pipelines can be employed, provided there is at least 125 psi. The danger with this, however, is that condensation in the lines may come through in surges beyond the capacity of the superheater to dry it out. Moreover, the normal moisture content of such steam is such that a large superheater is required, means must be provided for heating it, and a somewhat extensive arrangement of reducing valves, traps, strainers, and drains must be installed.

Special Guns Needed

Conventional air spray guns are not suitable because they would be too hot to handle, even with gloves, but steam spray guns are already being produced. American Brake Shoe Co., Binks Manufacturing Co., and DeVilbiss Co. have such units which combine cool handles, light weight, ease of disassembly for cleaning and changing nozzles, and a method of bleeding the steam to insure minimum condensation and avoid moisture and water spots on the finished surface when the gun is first opened and when spraying is resumed.

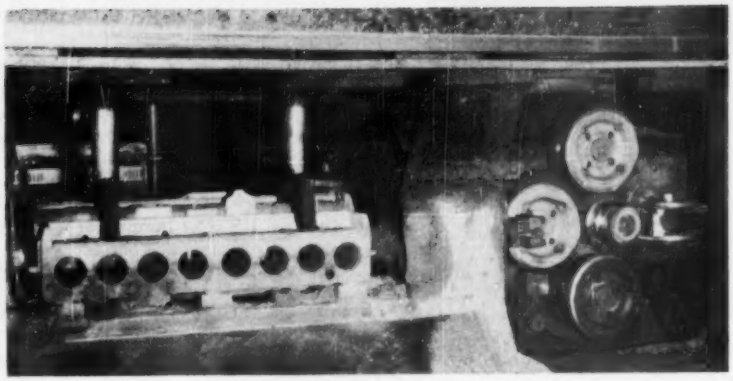
Because the nozzle temperature of the gun is constantly around 375 F, there tends to be a steady buildup of paint at the exit, and it may be necessary to increase paint pressure from time to time to offset this. It is good practice to have extra nozzle kits on hand and change them when necessary.

Safety Aspects

There is little or no danger from burns, although it is recommended that operators wear gloves as a precautionary measure. The superheated steam cools so rapidly that the operator can pass his hand through the spray at a distance of 12 to 15 in. from the gun without any discomfort.

Steam hose still presents some difficulties. If it is made with sufficient insulation so the operator can support it over his arm, it will be too heavy and bulky. However, research is proceeding on this item, with a view to obtaining minimum weight and maximum life.

To date, this factor has, in general, been conceded, and the operator wears gloves. In most cases the glove can be light, as the operator has few occasions to handle the hot hose.



Upper and lower faces of cylinder blocks are machined by traversing work past the cutters. Main bearing parting faces are milled by horizontal cutters, while a broach between them machines the width. Overhead power lines and cutter accessibility facilitate repairs

NEW BUICK CRANKCASE LINE SHOWS

Profiting by experience with earlier transfer machine lines, Buick engineers reduce downtime by improving accessibility of tools and components

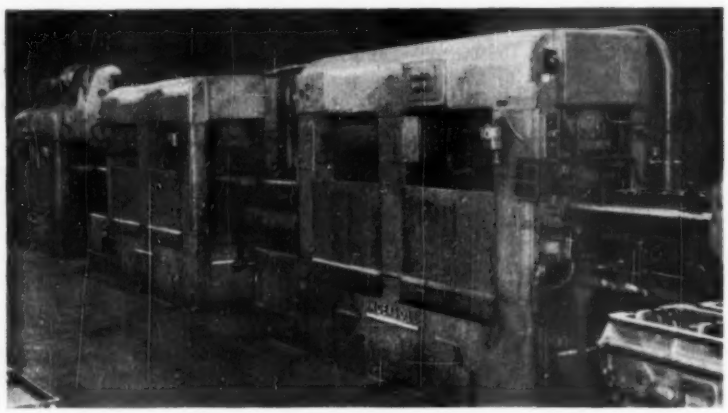
BY STAN WHITE, Superintendent of Engine Plant, BUICK MOTOR DIV., GENERAL MOTORS CORP.

TRANSFER lines for machining combined crankcase - cylinder block castings were considered the last word in modernity and economy when installed in 1946, and still continue to do a good job. Experience, however, revealed some drawbacks and, when a new line for the larger engine was installed recently, every effort was made to avoid troubles and delays previously encountered.

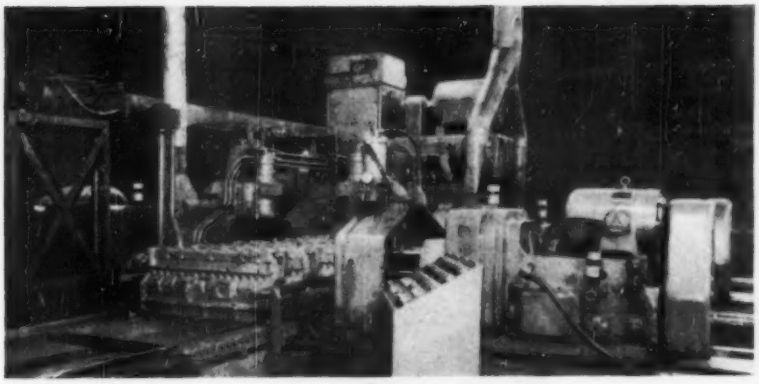
In most milling, for example, it has been found better to traverse the work rather than the cutter, as in some earlier setups. This tends to keep cutters more accessible and shortens downtime as well as labor for changing cutters.

Equally helpful is the overhead location of most electric lines and all major control panels. This keeps lines away from the floor, where damage and other troubles may result, saves floor space and helps to make both the electrical equipment and some portions of machines more accessible. When located on a balcony, control cabinets are easy to get at, yet unauthorized tampering is avoided.

Barnes drilling and tapping machines leave tools accessible from both ends to facilitate replacement in case of tool breakage. For drilling one cored oil-gallery hole run-



Oil-seal groove in main rear bearing is turned in first machine; second machine side mills center bearing surfaces; and third bores five main and five camshaft bearings. Boring tools are set up in grinding room and can be replaced in a few seconds



Oil and dowel pin holes are drilled in **Buick** blocks in this **Barnes** machine. One man operates the machine, which works on eleven pieces simultaneously. Lights on the control panel (foreground), indicate the location of any trouble which may occur

MANY IMPROVEMENTS

ning the length of the case, an air tube is inserted so the air helps to remove chips. The tube has a spring-loaded holder and if it hits an obstruction, it backs up and contacts a dog. This actuates a switch, turns on a warning light, and sets controls to prevent starting a new cycle until the trouble is remedied.

In earlier transfer machines, troubles with hydraulic control valves involved delays because the valves were not always accessible and many pipe joints had to be broken to remove them. Such troubles have now been minimized by centering the hydraulic controls at accessible points and arranging valves for easy removal by taking out a few flange bolts. Long hydraulic pipes are avoided and pressures are kept below 500 psi where possible.

Sides of center bearings that take thrust are faced in Ingersoll machines, equipped with cutters on wobble bars whose eccentricity is decreased gradually to increase cutting radius.

Core openings into jacket spaces are sealed by shallow-drawn steel cups driven in with air hammers. These were formerly supported by hand, and seals were sometimes cocked, giving rise to leaks. This is now avoided by supporting the hammers in heavy fixtures to hold them in line with the cap hole and normal to the cap. Supports are so arranged that cup lips are left flush with the boss face around the hole, as desired.

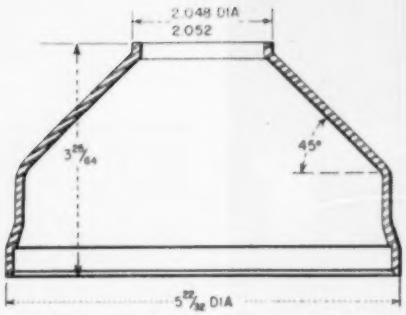
Tips FOR TOP SHOP MEN

370 "Queer ducks"—the men that don't fit the pattern—are also the men who don't think like the rest. They'll give you trouble, but they'll usually also give you ideas. Barnyard ducks conform readily to rules, but end up in a pot.

371 Only two of your possessions increase in value proportionally with price inflation. One is time, the other knowledge. You can employ both productively to build security, or squander them.

372 The really competent man multiplies his effectiveness by every man he influences. One man, no matter how able, is still one man; but one man believed in by enough others is unbeatable.

YOU MAY AS WELL FACE TH' MUSIC! HE'S BEEN THERE TWENTY MINITS — DON'T TRY ALIBIS—HE KNOWS ALL THE ANGLES TO LOAFIN'— STEP UP AN' ACT BUSY — DON'T WORRY, THERE'S A LOT OF JOBS OPEN NOW—I HOPE!
SUSPENSE



Smaller bowl shell for cream separator is spun, then finish drawn from stainless steel disk 0.140 in. thick, 8 in. in dia. Wall thickness is reduced to 0.105 to 0.109 in. by spinning to form truncated cone

Blanked and pierced disk swabbed with heavy drawing compound, is placed over square driver at top of cone-shaped spinning mandrel. All three hydraulic cylinders of machine have been retracted to clear disk for positioning

POWER SPINNING ELIMINATES ANNEALING

Stainless steel bowls for cream separators are spun on new, power-operated machine . . . Annealing and descaling, required on press operation, are eliminated and polishing time reduced

BY L. W. COURT, Works Engineer
RICHMOND WORKS, INTERNATIONAL HARVESTER CO.

POWER spinning of truncated cones from flat disks with an unusual hydraulic machine developed at International Harvester Co.'s Richmond Works has simplified production of bowl shells for cream separators. Annealing and subsequent descaling operations which followed press-drawing operations for making these stainless steel bowls have been eliminated. Four press operations no longer are needed, and high-cost polishing operations have been minimized.

Four different bowls are made for the several sizes of separators produced. These require blanks ranging from 8 to 10⅞ in. in dia, which is at least 1½ in. smaller than previously was necessary. Also, the spinning operation permits the use of Type 302 cold-rolled stainless steel of drawing quality. When the bowls were formed by progressive drawing, Type 430 stainless steel was considered necessary.

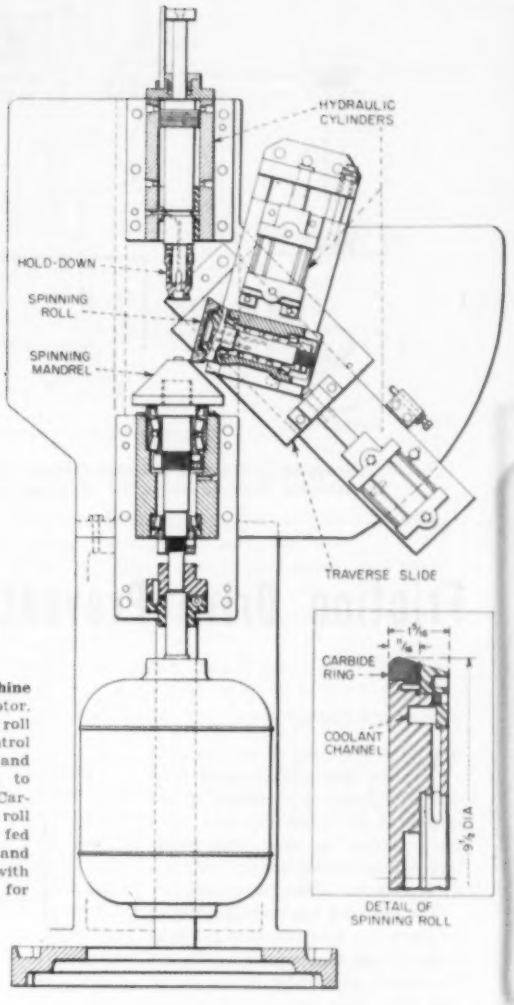
Blanks for all four bowls are 0.140 in. thick. Pressure of the spinning roll reduces the thickness to 0.105 to 0.109 in. over the spun area. The large diameter of the cone is the same as the OD of the blank, thinning of the metal by roll pressure being sufficient to give the added surface area needed to form the cone.

While cones spun as the first step in the production of bowl shells have an included angle of 90°, the roll traversing slide of the spinning machine can be set to produce any required included angle from 50 to 110°. Spinning mandrels or dies are interchangeable on the vertical work spindle and are changed to suit each size of blank and included angle of cone. These mandrels are made from tool steel, hardened to 50-55 Rc, and nitrided so they will not distort under spinning pressure.

First operation on the blank is to pierce a square hole in the center so it can be engaged on a square driver projecting above the center of the spinning mandrel. It is important that the dimensions of this hole be held accurately so the driver will fit snugly and prevent off-center positioning.

Following the single spinning operation, the shells are trimmed on the OD to remove the lip left by the spinning roll, drawn to final shape, pierced in the center, and formed at the neck in a three-station die. A lip is left by the spinning operation because the carbide roll would be damaged if allowed to run off the work surface under heavy pressure. One operator takes care of the spinning and the two successive press operations, the cycles of the three machines

Hydraulic pressure at 650 psi clamps disk on mandrel, forces roll against disk at edge of flat on top of mandrel, and traverses roll down side angle to close disk against mandrel. Stops prevent overtravel of cylinders

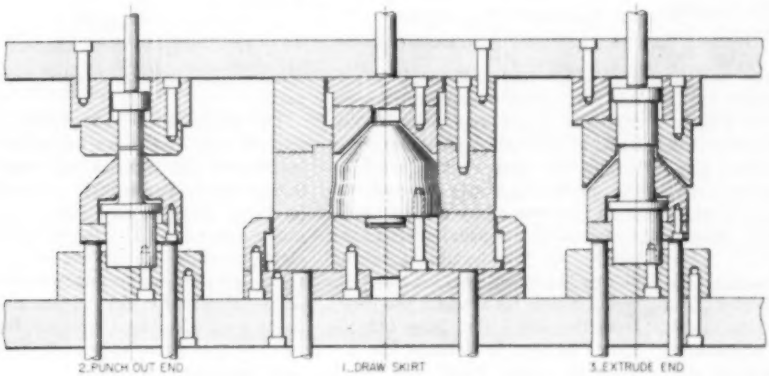


Power spinning machine has 10-hp, 700-rpm motor. Two cylinders on roll traversing slide control pressure on work, and move slide parallel to spinning mandrel. Carbide-faced spinning roll is cooled by water fed through spindle, and must be concentric with bore within 0.0005 in. for good finish.

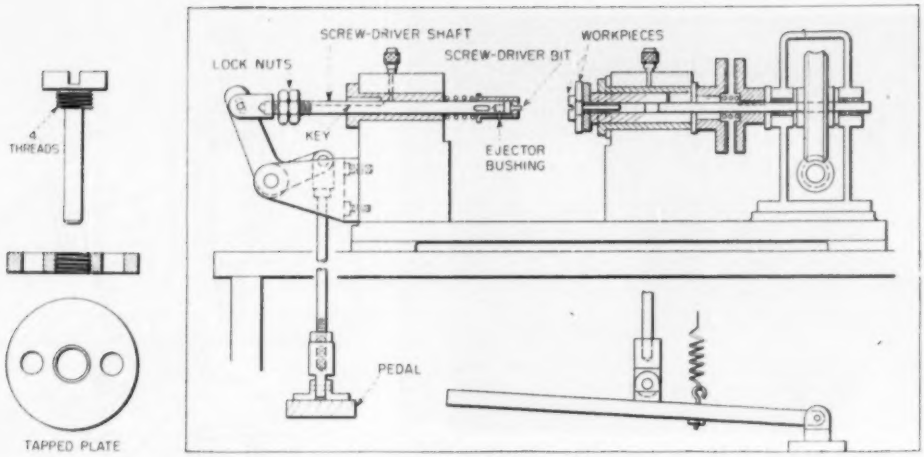
AND DESCALING

having been synchronized to produce one finished bowl per minute. Formed bowl shells later are machined at both ends, then carefully polished inside and out.

Spinning is done with the work revolving at 700 rpm. Faster speeds could be maintained, but would produce rougher surfaces which would have to be polished out later. So it is better to hold spinning speed down to permit synchronization with the presses, and reduce the polishing time.



Skirt is drawn to final form in center die after trimming OD to remove lip left by spinning roll. Flat in small end is pierced in left-hand die, and neck end is formed to shape and coined to eliminate burrs in right-hand die



Stripping of only four fine-pitch threads on the special screw is avoided by a friction-driven assembly machine. Torque is easily preset by positioning the locknuts on the screwdriver shaft

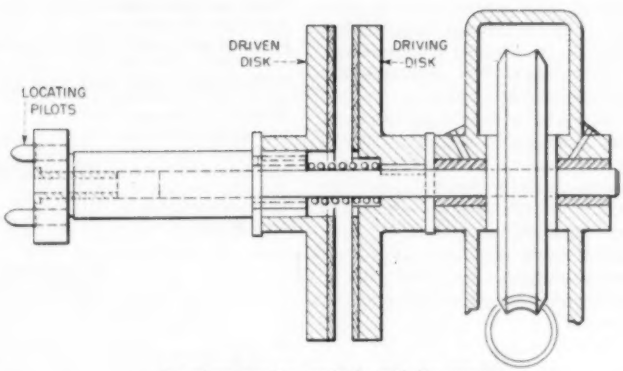
Friction Drive Prevents Stripping Fine Threads

BY B. P. FORTIN, Sr.

WHEN a special screw has only a few fine-pitch threads, special equipment is necessary to assemble it to its mating part on a mass-production basis. This problem can be solved with a friction-driven, pedal-controlled machine.

The operator has both hands free to place the workpiece in the machine. First, the tapped workpiece is located on spindle by means of two pilot pins. Second, the special screw is slipped into the bushing in the spindle. Thereupon, the operator steps on the pedal, the screwdriver bit advances, and its surrounding, spring-backed bushing presses against the work plate. The spindle and its friction disk are forced into contact with a driving disk powered by a worm drive. When the screw is driven home with proper torque, the friction clutch slips.

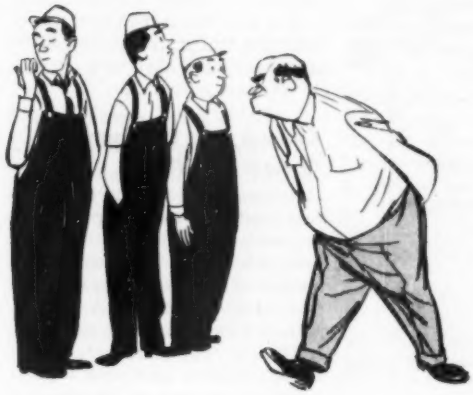
To achieve these results, the screwdriver bit is screwed into a shaft keyed to a bushing in the left-hand head. Torque adjustment is provided by two locknuts that limit shaft travel. When the friction drive slips, the operator knows that the screw has been driven home in the work plate with proper torque. He removes his foot from the pedal, and the screwdriver shaft is retracted by a spring connected from the pedal shaft to the bench. As this occurs, a spring ejector bushing surrounding the screw driver bit retracts the latter from the screw slot. Now the operator is free to remove the assembled item from the work spindle and replace it with new parts.



Locators can be made to suit the work

The work spindle is keyed to its friction disk and slides on an extension of the wormwheel shaft that drives the power disk. A spring pocketed in these two disks normally keeps them apart until sufficient pressure is applied to the work spindle by the screwdriver shaft. Power for the bench machine is supplied by a motor at the rear of the worm drive. Cost of such equipment is small.

ROUND TABLE



Shop FBI

"Just found out a drive pinion on the apron of that new 10-in. lathe is stripped, Al—and nobody knows how it was done, of course. I'm darned sure it didn't strip itself—and nobody but my boys has run the lathe. We need a shop FBI!"

"Maybe there was something wrong with the gear, Ed, and that made it strip."

"Don't be silly, Al. We've run it for several months, and it was O.K. until Nicholson—the operator—took off sick. Now he comes back—and it's on the fritz."

"Are you sure it couldn't have happened before Nicholson left?"

"Listen, Al, Nicholson is an old-timer and the best lathe hand in the shop. In the first place, he wouldn't do something that could damage his machine. In the second place, if it wasn't right up to snuff, he'd yell to high heaven."

"Do you think somebody wrecked it, Ed? Sabotage or something?"

"No, not sabotage, but some damnable carelessness. I think some bonehead was fooling around with it and jammed it. It looks to me like pure stupidity. And now the guy is afraid to confess."

"Does anybody remember—or admit—who was using the machine last, Ed?"

"Nope. Nobody seems to remember anything about it."

"Well, forget it. Report the damage and order a new part."

"And what reason will I give? If I say it's broken—and can't tell how it happened, the Big Boss will think I'm stupider than he does now."

"There isn't much else you can do. Sooner or later, it will have to be reported—and fixed. Maybe you should set up a fake job, and 'break' it all over again, Ed."

"Nope, I won't do that—but maybe I should set up a system by which nobody can run a machine without signing for it like he does for small tools."

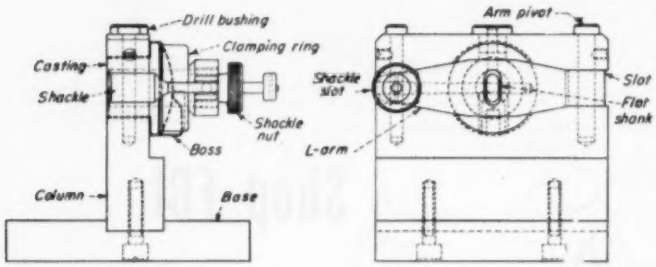
"A checking system for machine tools—and in the toolroom at that! Doesn't sound very sensible to me."

"It's just as sensible as having a busted machine that nobody busted. If the men don't trust me, I won't trust them. I'll set up an SBI—Shop Bureau of Information."

"Maybe the first suspect will be you, Ed—it's pretty suspicious when your own men won't tell you when something is wrecked."

***IS THE RULE** of "one man operates each machine" a sound one? What about multiple shifts? Will an amateur FBI do anything but cause trouble? Your ideas and opinions on this subject will help others. Discussions of earlier topics appear on later pages.*

Practical Ideas



Drill Jig Locates Casting By Gripping Boss on Head

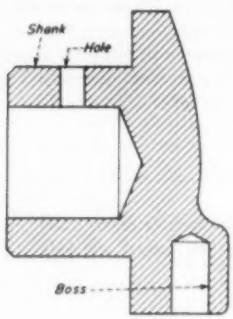
AUTOMATIC-LATHE PRODUCTS, like this casting with a domed head and off-center boss, often require second-operation drilling to cut holes perpendicular to the axis. For this job, a special jig was built to grip the casting so a hole would be drilled 180° opposite the boss and at a close dimension from the inner face of the head.

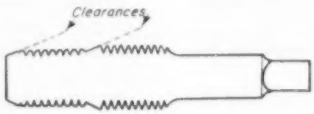
A flat, stepped column was bolted into a slot across the heavy baseplate, and a hole was bored through the column to take the finished OD of the casting's shank. Cutting into this hole from above was a smaller hole that took a drill bushing.

Clamping was done with an L-shaped arm, pinned into the column in a slot in the right side. A similar slot in the left side of the column admitted a shackle, which was also pinned in position. To grip the casting, the L-shaped arm was closed over the head of the part and a nut was screwed down to catch the shackle in the open end of a slot in the arm.

To hold the casting in alignment, a clamping ring was inserted by its flat shank in a slot in the arm. This ring was recessed to fit over the domed head of the casting and to fit around the extended boss.

Such a positive arrangement made accurate machining easy. The fixture also was quicker-acting than previous methods, reducing handling time by half. *W. M. Halliday, Southport, England.*





Stepped Tap Demands Less Power Takeoff

I NEEDED to tap a $^{3}/_{4}$-16 thread in a steel casting, but the capacity of the only tapping machine available was 7/16 in. This meant that although we could chuck the large tap, there was not enough power available to run the tap in under normal conditions. By grinding a standard $^{3}/_{4}$-in. tap to form a step section, we were able to split the load into two parts.

The standard tap was centered, and the front half of the thread was ground down to about half its normal height. Clearance was ground between the two sections of thread, and both sections were ground to chamfers on the front.

The hole was tapped more easily with this tool than a normal 7/16-in. thread could have been cut. *Jay B. Shriver, Fulton, Mo.*

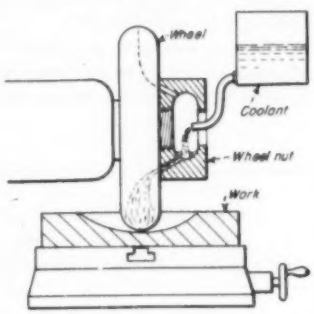
Cupped Nut Distributes Coolant in Wheel

GRINDING LARGE RADII in big molds was a job that made normal cooling methods inefficient. To keep heat down in the wheel and on the surface of the work, I made a special wheel-clamping nut and attached it to the grinder spindle.

The nut was bored out so only about a third of the thread was left inside it. In front of the thread—toward the outside of the setup—the bore was large to form a sort of cup. Leading from the largest ID inside the cup were a number of drilled holes that angled out toward the OD of the nut and broke through the nut on the surface that clamped against the wheel.

Coolant was directed inside the cup in the nut from a tank that fed by gravity. High pressure was not needed for this job. Coolant drained into the drilled holes and fed through them to the inside of the wheel.

Because of centrifugal force, the coolant not only fed through the wheel at all points, but also fed through all holes in the nut at the same time. This made cooling constant and efficient. *R. G. Vare, Holmsley, England.*



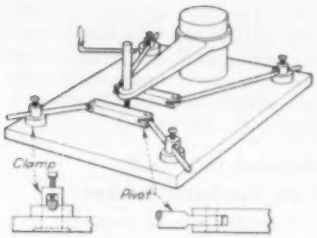


Plate Clamps Hold Work On Tapping-Fixture Base

ONE OF THOSE commercial tapping fixtures was received recently in our shop. This one had nothing for holding the work except for a single pin that fitted holes in the baseplate. We made a much better workholder, even though it was more complicated, by fitting two clamping strips to the plate.

Four clamps, one for each corner of the baseplate, were made as illustrated. These were fitted in drilled and countersunk holes. Two rectangular strips of steel were slotted at each end, and round rods were pinned into place. The rods were then clamped at the four corners.

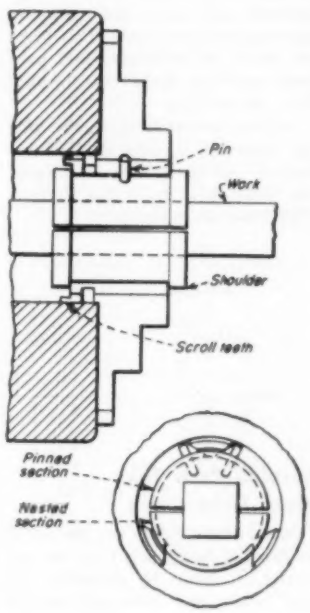
Work is first positioned under the tap, then the tap is lowered to enter the drilled hole. Finally, the strips are pushed against both sides of the work to brace it, and the four clamps are tightened to hold the rods and strips firmly. *Gerhard Wenke, Los Angeles, Calif.*

Split Bushings Chuck Square Stock Securely

IT IS COMMON PRACTICE to hold square bar stock in a three-jaw chuck with a split bushing that is milled out to the shape of the stock. The method provides true-running and concentric turning of the work, but it doesn't always keep handling time down. Often the top section of the bushing will fall away when the chuck is loosened so new stock can be brought up to position for cutting.

To make sure that both sections of the split bushing stay put, we make the adapter with a slight flange or shoulder at each end of the OD. These are spaced to fit in front and behind the chuck jaws with a little clearance to spare.

One bushing section is simply nested on two of the chuck jaws, while the other is held by only one jaw — but retained and kept from rotating independently of the chuck by two pins driven into holes in the bushing half. *Tom Brown, Perivale, England.*



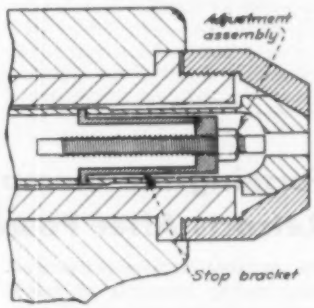
Refitting Tailstock Centers

ON LATHES where the tailstock center is no longer directly in line with the headstock center, this method of drilling a new spindle for the tailstock will bypass the usual trouble of shimming up the whole tailstock block.

First a new bar of stock is turned to fit in the tailstock casting and bearings, and is slotted for the key. A hole is also drilled and tapped in the rear to take the feedscrew and its mechanism.

Now the bar is inserted in the tailstock, a centerdrill is chucked and centered exactly in the headstock, and the tailstock is moved along the ways up close to the headstock. After a center has been drilled exactly in line with the headstock bore, the bar can be drilled out and taper-reamed directly in the same lathe; or can be finished in another machine.

After this treatment, the lathe should ream, drill, and tap on dead center. This method is much more satisfactory than shimming up the tailstock, and is cheaper than installing a new block on the ways under the tailstock casting. *Charles A. Newkirk, Jersey City, N. J.*

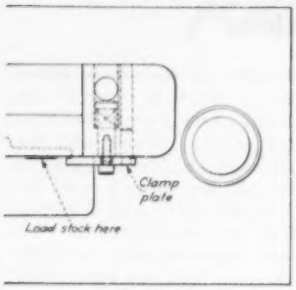


Second-Operation Stop Locates Work in Collet

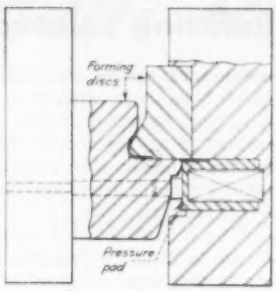
TO LOCATE partly turned work exactly in a collet for a second operation—especially for facing a back end or finishing a turning pass—this adjustable stop can be added to practically any kind of collet lathe. Furthermore, it can be used either forward or backward, providing a large range of depth settings.

An adjusting screw with squared-off ends is threaded into a turned, bored, and flanged cup. A locknut is added to prevent the screw from moving during pounding.

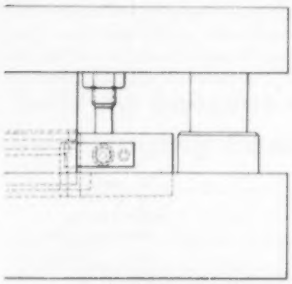
The flange of the cup is located between the end of the collet push tube and the back edge of the collet itself. This flange is fairly thin, so collet action is not affected. *Arthur R. Christensen, Lockport, N. Y.*

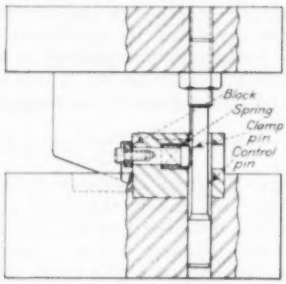


Top view



Section through die


Front view



Section through clamp

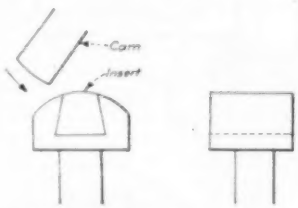
Forming-Die Clamp Retracts After Power Stroke

AN UNUSUAL CLAMPING mechanism, readily adaptable to many kinds of forming dies is illustrated. The die on which the original clamps were installed bent a long piece of spring steel to the profile of the forming die.

A clamp assembly consists of a steel block, bored to admit a short horizontal pin with a rounded end, and recessed to take a compression spring. By acting against the shoulder on the pin, the spring loads it in the direction of the long vertical pin that is carried on the upper die so it will work through a hole in the clamp-assembly block. Clamping is done with a small plate attached to the other end of the short pin, which overlaps the stock only about ⅛ in. at its edge.

Stock is loaded vertically in the slot between the forming die and the pressure pad. As the upper die comes down, the long pin drops and exposes the surface of a smaller diameter to the end of the spring-loaded pin, which jumps forward and brings the clamping plate against the stock. This grips the work at both ends and prevents shifting while the forming dies are working.

As the ram raises again, the long pin goes up, forcing the spring-loaded pin back, which releases the workpiece from the clamps. *Cliff Bossman, Dayton, O.*



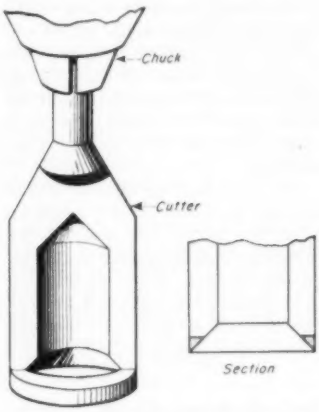
Carbide Pads Take Wear From Cams

CONSIDERABLE TIME can be saved in making new push rods for our eyelet machines by grooving the pad heads and inserting carbide blocks to bear against the cams. The carbide stands up much longer than plain steel, and when it does wear and chip, replacement pads are simple to insert. *Charles A. Lauer, Ft. Wayne, Ind.*

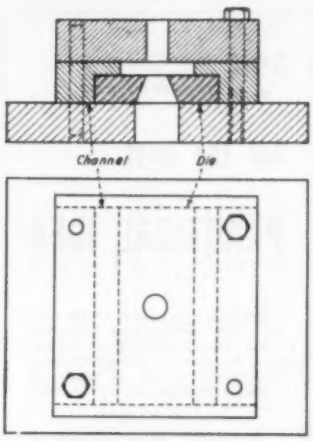
Beveled Drill Tool Cuts Synthetic Rubber

CUTTING KORPRENE is difficult, just as is cutting any synthetic or natural rubber-like material. For slicing round disks of the substance, a drillpress cutter is used—chucked like a drill.

The cutter is a piece of round stock, the same OD as the OD of the disk desired, and is turned down at one end to a small diameter which can be chucked. The cutting edge is formed inside the bar, after it has been drilled, by boring a slanted edge back from the bottom. Finally, a section of the cutter body is milled away to expose the hole drilled up the center of the body. Part of the cutting edge is left on this side of the cutter so the edge will be a complete circle.



When cutting disks of the Koprene material, the drill is operated at high speed. Disks are forced up progressively into the hole in the cutter, but pop out of the cutaway section to keep the hole clear. The best edge for cutting is a plain sharpened edge—not serrated or toothed. *General Electric Co., Schenectady, N.Y.*



Channeled Members Clamp Simplified Die Block

IN THE COURSE of making a die for a special job in our shop, someone forgot to drill holes through the die for clamping and alignment. But this result of haste, although it appeared to be serious, showed us a good way to simplify and speed other die jobs.

Our design department had made a rough drawing of the die, and, in order to cut aside red tape, we had taken the design directly to the diemaker. He finished the die in record time, but it was only after he had hardened and ground the die that he found the error.

To save this die we made a pair of simple clamping pieces from mild steel. These were only channels cut away to hold the edges of the die, which was to be held onto a die holder. The assembly was made as illustrated, with the die on the holder, the channels over the die, and bolts through the stripper, clamping pieces, and die holder to clamp the whole business together.

After the press setup was made, stock was fed through from one end to the other, producing exactly the results we originally desired. The channeled clamping pieces were made the right width to act as side stock gages and guides, so the resulting die was quite simple, yet effective. *Federico Strasser, Santiago de Chile.*

Angle Setup on Mill Cuts Internal Ellipse

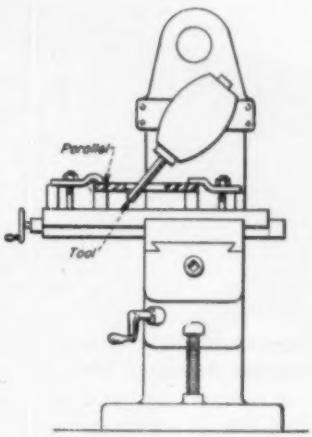
A METHOD of milling a perfect external ellipse was described by H. R. Gilliam (*AM* Sept 18, p128). Here is a similar method that forms an internal ellipse.

The work is roughed out with any convenient methods, and is then set on parallels and clamped to the machine table. Being on parallels raises the work so a tool that works partly below it will clear the table.

The swiveling head of the miller is turned to the required angle, and a boring tool is chucked. An ellipse is formed as the table and work are raised, making the work pass around the path of the tool.

To find the angle setting, divide the minor axis of the work by the major axis, then look up the angle in a cosine table.

Limitations on this setup may be imposed if the workpiece is thick, the boring bar is large in diameter, or the angle is large. However, as long as the work does not hit the boring bar before it has been cut through, this system is usable and accurate. *Francis J. Spollen, Princes Bay, LI, N. Y.*



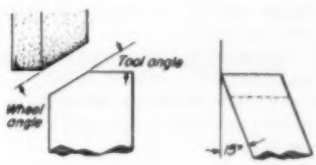
Form-Tool Table Compensates for Clearance

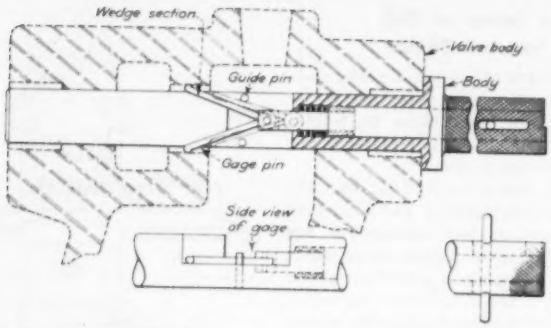
THIS TABLE is based on a front clearance angle of 15°, which is fairly common, and gives angles to be dressed on grinding wheels to produce given side or form angles when such angles are simple.

It was devised after I had a job of grinding up some form tools. Although the correct angle for any given condition can be found by cut-and-try, a table like this saves time and effort.

Tool Angle	*Wheel Angle*
10°	10°-20′
12½	13
15	15-30
17½	18
20	20-40
22½	23-10
25	25-40
27½	28-20
30	30-50
32½	33-22
35	35-50
37½	38-20
40	40-58
42½	43-29
45	46

To grind the form angle on the tool, and at the same time compensate for the clearance angle that would normally be ground straight across the front of the tool, the compensated angle is dressed on the wheel with a sine-bar attachment of some sort. The wheel angles can be either slanted to the right or slanted to the left. For curved profiles on tools, any short section of the edge can be taken, the angle measured, and the curve can be dressed on the wheel—but slanted off at approximately the same correction for the angle of a straight section. This is not completely accurate, but will do in most cases. *R. G. Vare, Holmsley, England.*





Expansion Gage Checks Internal Protected Holes

THE ARTICLE by L. O. Blackstone (*AM* Sept 18, p 130) on a swiveling gage showed a good way to check a hole that is difficult to get to with ordinary gages. The author mentioned that conventional expanding gages *would not* work in that case, so here is a gage design that *will* work.

This is a flush-pin gage with the body turned to slip into the smallest hole through which the critical diameter must be measured. The body has a shoulder on its end which is brought against the edge of the valve body being inspected. Inside the body, a small-diameter rod works against a spring to expand two pins that are pivoted at the end of the rod. As the rod is pushed forward, the pins are separated to expand against the ID of the hole by a wedge section of the gage body. The working rod is forced forward by a pin near its outside end, which clears the gage body through a slot.

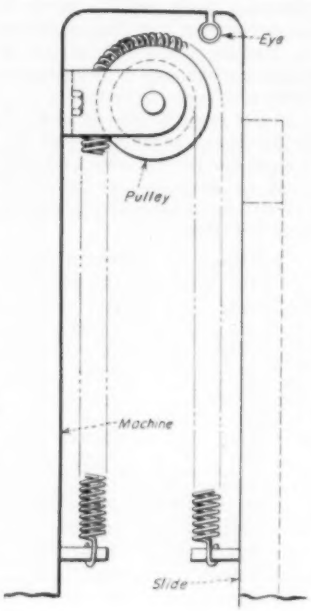
Gage marks on the body indicate, when the pins are extended, whether the diameter is large, small, or right on size. *D. E. Sweet, Marblehead, Mass.*

Pulley Support Cuts Spring Breakage

HERE IS A principle for reducing spring breakage around the shop that can be followed in many cases. A machine had a return spring for the slide, but this was breaking often because the spring was overstretching. We eliminated the trouble by changing the spring arrangement and replacing the spring with a longer one.

The original spring was carried between a pin on the slide and an eye on the machine frame. We installed a bracket with a pulley up near the eye, inserted a pin on the frame almost opposite the one on the slide, and inserted the new, longer spring — which wrapped over the pulley.

The effective length of the spring was doubled, and the grooved pulley equalized tension so no more breaks occurred. *L. Kasper, Philadelphia, Pa.*



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PAYMENT— $25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS —Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

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(For October 2 issue)

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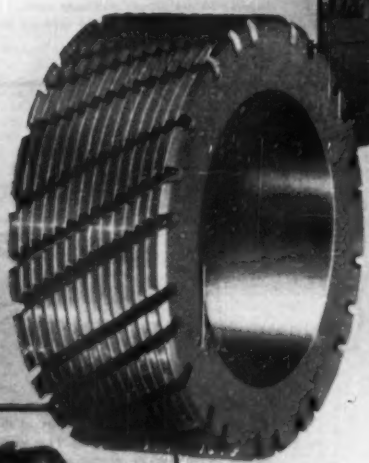

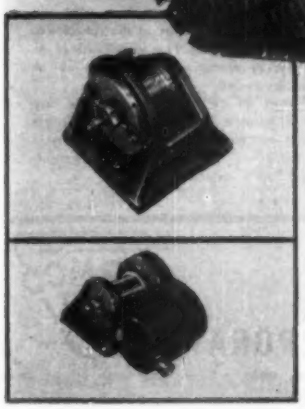

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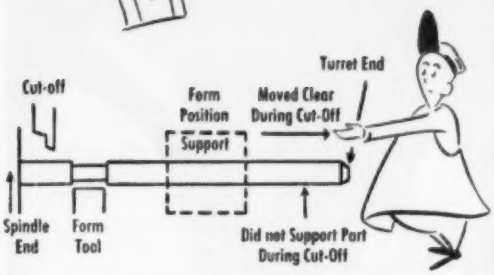
GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS • CONTACT SERVICES • THREADING TOOLS

Use Sturdy Supports for Cut-Offs

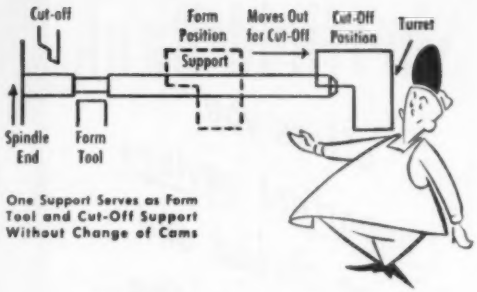
Stainless Sam says



1

A machine shop was having trouble with cut-off tool failures when working with long sections of stainless steel bars. In some cases the part even broke off before completion of the cut-off. At best, the cut-off surface was unsatisfactory.

Stainless Sam found the operator's set-up included a support like the one shown in this drawing.



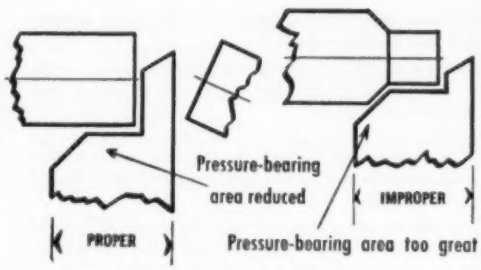
One Support Serves as Form Tool and Cut-Off Support Without Change of Cams

2

Stainless Sam solved the problem for this shop by extending the support from the turret, incorporating a split-type bushing. This way the part is well supported during the cut-off operation.

The hook (top rake) angle was also increased to 15 degrees on the cut-off and form tools.

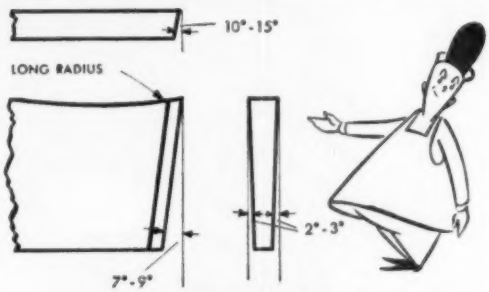
All alterations were made without any change of cams in the machine.



3

When using a combination form and cut-off tool on austenitic stainless steels, be sure the cut-off section completely severs the part before the form tool makes contact with the bar. You can do this by increasing the length of the cut-off tool.

Pressure-bearing areas are reduced by decreasing the width of the form tool.



4

For cut-off operations on Stainless Steels, tools should be made of high-speed steel, one of the cobalt tool steels, cast alloys or carbides. If a high finish is required, a secondary operation with facing tool or grinding is recommended.

A cutting angle of 10° to 15° facilitates chip removal and is suitable for small work. On larger parts this angle can be reduced to 5°. Clearance is provided by the 2° to 3° angle indicated. A front-rake angle of 7° to 9° is recommended.

Cut-off tool work is only one of many subjects discussed in Armco's valuable booklet on the Machining of Armco Stainless Steels.

Write for your copy today. It may surprise you to know how easy it is to machine Armco Stainless Steels with standard equipment.

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JIC Pneumatic Standards . . . I

The Joint Industry Committee of the automotive industry formulated these standards for pneumatic equipment in a manner comparable to that used for previous standards for hydraulic equipment and electrical equipment deemed necessary on machine tools and other equipment used in mass production. Groups that lent their assistance were: the National Machine Tool Builders Association, packing and seal manufacturers, pneumatic-equipment manufacturers, press builders, and tubing and fitting manufacturers.

FOREWORD

THE term "Industrial Equipment" referred to in these pneumatic standards for industrial equipment applies not only to machine tools, but also to other types of industrial equipment which are air actuated.

The prefix letter "A" is used throughout these standards to denote its applicability to pneumatic equipment.

Where the letters "J.I.C." are used they refer to the Joint Industry Committee of the automotive industry.

A0—GENERAL

A0.1. (*A*) The purpose of these standards is to provide specifications for the application of pneumatics to industrial equipment which will promote safety of personnel, uninterrupted production, long life of the machine, equipment or tool, and will not limit or inhibit advancement in the art of pneumatics.

(*B*) Where new developments in pneumatics will perform in a manner equal to these specifications they will be considered as equivalent.

A0.2. These standards are proposed to cover pneumatic equipment in general applications. Any exceptions to these standards will be as agreed upon between supplier and purchaser.

A0.3. The purchaser shall specify such additional details as are needed to meet unusual operating conditions.

A0.4. (*A*) The builder shall submit necessary performance specifications on pneumatic equipment, including symbolic or schematic diagrams in accordance with paragraph A1.1.4 (*A*) for purchaser's approval. Final diagrams and text shall conform to the pneumatic equipment shipped.

(*B*) Part numbers shall be provided for all types of pneumatic equipment. Seal manufacturer's catalog number shall also be provided where sealing devices are commercially available.

A0.5. All pneumatic equipment shall be installed and used in accordance with the recommendations of the manufacturers thereof.

A0.8. All industrial equipment at the completion of assembly and before shipment shall be given complete performance tests to determine conformity with equipment specifications. There shall be no evidence of external leakage.

A0.9. A pressure-time diagram taken under operating conditions, including data concerning maximum rate of pressure rise, shall be furnished when specified on purchase order.

A0.10. Pneumatic equipment shall be of proved engineering design, fabricated of material of accepted quality and with workmanlike finish; and must be capable of performing efficient, reliable service in the installation for which it is provided.

A0.11. Pneumatic equipment and piping shall be accessible and mounted in a position that will not interfere with machine adjustments or maintenance of electrical, hydraulic, or mechanical equipment. (See A2.6.3. A 4.2.6 and A6.3.4.)

A1—DIAGRAMS

A1.1—Circuit Diagrams:

A1.1.1 (*A*) Symbolic Diagram — A drawing or drawings showing by means of approved standard symbols each and every piece of pneumatic apparatus, including all interconnecting lines.

(*B*) Schematic Diagram—A drawing or drawings showing the functional construction of all valves, controls, and actuating mechanisms including all interconnecting lines.

A1.3—STANDARD SYMBOLS *for Use in Circuit Diagrams*

LINES

LINE, WORKING	———
LINE, PILOT	— — —
EXHAUST	- - - - -
LINE, FLEXIBLE	∪
CONNECTOR (DOT TO BE 3 X WIDTH OF ASSOCIATED LINE)	•
DIRECTION OF FLOW	——►
LINE, PASSING	——+——
LINE, JOINING (TEE CROSS ETC.) (DOT TO BE 3 X W)	——┴——
STORAGE OR SURGE TANK	⬭
PLUG OR PLUGGED CONNECTION	×
TESTING STATION (GAGE CONNECTION)	---✳
POWER TAKE-OFF	——✳
RESTRICTION, FIXED	—><—

COMPRESSORS

COMPRESSOR, SINGLE FIXED DISPLACEMENT	CF
COMPRESSOR, SINGLE VARIABLE DISPLACEMENT	CV

MOTORS & CYLINDERS

MOTOR, ROTARY FIXED DISPLACEMENT	MF
MOTOR, ROTARY VARIABLE DISPLACEMENT	MV
MOTOR, OSCILLATING	MO
CYLINDER, SINGLE ACTING PLUNGER TYPE	
PISTON TYPE	
CYLINDER, DOUBLE ACTING SINGLE END ROD	
DOUBLE END ROD	
CYLINDER, ROTATING, AIR	R

MISCELLANEOUS UNITS

MOTOR, DRIVE, ELECTRIC	ELEC MTR
LUBRICATOR	LUB
INTENSIFIER	INT
ACCUMULATOR	ACC
FILTER	FLT
SEPARATOR	SEP
PRESSURE SWITCH	PS
PRESSURE GAGE	
SPRING	
SHAFT, ROTATING	
COMPONENT ENCLOSURE	

VALVES

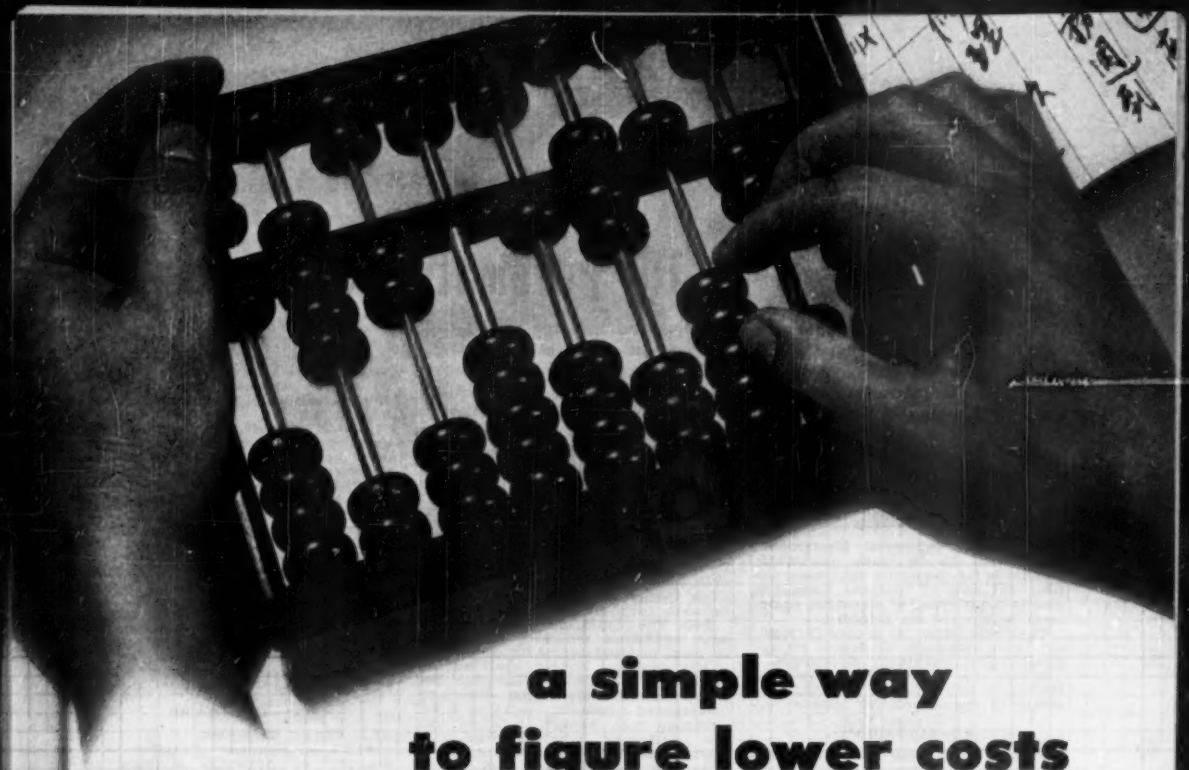
VALVE, CHECK	
VALVE, RESTRICTION, VARIABLE	
VALVE, BASIC SYMBOL (INSERT MODEL NO. FOR SPECIAL VALVES)	
METHOD OF INDICATING INTERNAL FLOW	

VALVE EXAMPLES

VALVE, MANUAL SHUT OFF	
VALVE, MAXIMUM PRESSURE	
VALVE, RELIEF REMOTELY OPERATED	
VALVE, SEQUENCE DIRECTLY OPERATED	
VALVE, PRESSURE REGULATOR	
VALVE, FLOW CONTROL PRESSURE COMPENSATED	(PC)
VALVE - SHUT OFF 2 POSITION - 2 CONNECTION	
VALVE, DIRECTIONAL 2 POSITION - 3 CONNECTION	
VALVE, DIRECTIONAL 2 POSITION - 4 CONNECTION	
VALVE, DIRECTIONAL 3 POSITION - 4 CONNECTION CLOSED CENTER	

METHODS OF OPERATION

CONTROL, BASIC SYMBOL	
CONTROL, CENTRIFUGAL	CENT
CONTROL, COMPENSATOR	COMP
CONTROL, COMPENSATOR PRESSURE	PR COMP
CONTROL, COMPENSATOR TEMPERATURE	TEMP COMP
CONTROL, CYLINDER	CYL
CONTROL, DETENT	DET
CONTROL, MANUAL	MAN
CONTROL, MECHANICAL	MECH
CONTROL, MOTOR ELECTRIC	ELEC MTR
CONTROL, MOTOR AIR	AIR MTR
CONTROL, PILOT HYDRAULIC	HYD
CONTROL, PILOT AIR	AIR
CONTROL, SERVO	SERVO
CONTROL, SOLENOID	SOL
CONTROL, SOLENOID HYD. PILOT OPERATED	SOL HYD
CONTROL, SOLENOID AIR PILOT OPERATED	SOL AIR
CONTROL, THERMAL	THERM
CONTROL, PILOT HYD. DIFFERENTIAL AREA	HYD DIFF



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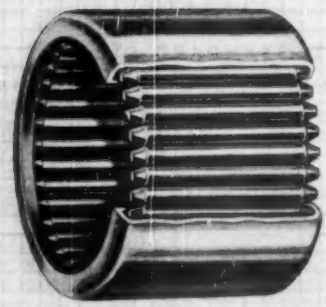

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JIC Pneumatic Standards . . . II

A1.1.2—Symbolic Diagrams:

(*A*) Symbolic diagrams shall be furnished with industrial equipment. (Schematic diagram acceptable).

(*B*) A copy of the diagram shall be firmly attached to the inside cover of the pneumatic control inclosure or pneumatic diagram inclosure, either by adhesive material or by permanent data pocket or clip.

A1.1.3—Schematic Diagrams:

(*A*) When requested on purchase order, a schematic diagram shall be supplied.

(*B*) When requested on purchase order, a schematic diagram shall show and describe the flow paths for each phase of each complete cycle.

(*C*) When requested on purchase order, a schematic diagram shall show in color only those portions of the circuit which are functioning at each single phase of the cycle. (See A1.4)

A1.1.4—All Diagrams:

(*A*) The descriptive text shall explain the function of all components of the circuit and the sequence of the operations. Either the diagram or descriptive text shall include, in addition to the sequence of operations, the following when applicable:

1. All pneumatic equipment shall be identified. When possible catalog number and manufacturer's name shall be shown.
2. Size of piping.
3. Diameters of pistons and rods, length of stroke, and estimated required force of cylinders when other than maximum pressure is applied.
4. Time of cycle, when pertinent. (For example: Time range of cycle exclusive of loading).
5. Operating pressures.
6. Horsepower and rpm of each pneumatic drive.
7. Delivery and consumption of air in cu ft per min.
8. Storage or surge tank capacity in cu ft.
9. Displacement, speed range, and torque rating of each pneumatic motor.
10. Data or text, or both, shall show operations performed and characteristics of any actuating electrical equipment used.

(*B*) The related text and the diagram shall be shown on the same or facing pages.

(*C*) All diagrams shall be marked with special number or with the purchaser's order number of that equipment, or, if none, with some other symbol which will identify the particular apparatus to which the diagram applies.

A1.1.5. Requested number of copies of final diagrams and texts shall be forwarded by mail or in person to an individual delegated by the purchaser not later than the date on which the shipment is made.

A1.3—Standard Symbols:

(*A*) Standard symbols shall be used for symbolic diagrams and for showing flow paths in schematic diagrams.

(*B*) Directional Control Valves: The flow condition which is shown closest to the operating device is that which exists when the device is operated.

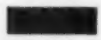
(*C*) The standard symbols and sample drawing of a pneumatic circuit utilizing the standard symbols to indicate the nature and function of component parts in the circuit are shown.

A1.4—Legend Code:

A1.4.1—Color Code

Function	Color
Intensified Pressure	Black
Supply Pressure	Red
Charging Pressure Intermittent	Red
Metered Flow	Yellow
Exhaust	Blue
Intake	Green
Inactive	Blank

A1.4.2—Pattern Code:

Function	Pattern No.	Suggested Zip-A-Tone or Equivalent Pattern
Intensified Pressure	7R	
Supply Pressure	177	
Charging Pressure) Reduced Pressure)	52-0	
Metered Flow	63	
Exhaust	75	
Intake	16	
Inactive	Blank	

A1.4.3—Definition of Functions:

Function	Definition
Intensified Pressure	Pressure in excess of supply pressure and which is increased by a booster or intensifier.
Supply Pressure	Power actuating air.
Charging Pressure	Compressor-inlet pressure that is higher than atmospheric pressure.
Reduced Pressure	Auxiliary pressure which is lower than supply pressure.
Metered Flow	Controlled flow rate.
Exhaust	Return of power-actuating medium to atmosphere.
Intake	Sub-atmospheric pressure, usually on intake side of compressor.
Inactive	Air pressure which is within the circuit but which does not serve a functional purpose during the phase being represented.

A1.5—Diagram Size:

A1.5.1. All diagrams shall be of such size as to disclose clearly all components of the system. Diagrams shall be 8½ x 11 in. or folded to that size.

A2—PNEUMATIC CONTROLS

A2.1—Definition of Controls:

(*A*) Manual controls are those actuated by the operator, regardless of means.

(*B*) Automatic controls are those actuated in response to the cycle of the equipment.

A2.3—Protection:

A2.3.1. Over-pressure and under-pressure regulation shall be provided on pneumatic circuits where required. The adjustments on the pressure control units shall be accessible. Provision shall be made to permit locking inclosure on compartment in which pressure control unit is mounted, or protective locking-type adjustments shall be provided to prevent tampering.

A2.3.2. All pressure controls shall be so constructed as not to be adjustable outside nominal working ranges, and shall be marked to indicate nominal minimum and maximum pressures.

A2.3.3. Where there is more than one source of supply on the equipment and possible damage may be caused by the stoppage of any one source, interlocks shall be provided so that the stoppage of one source in the circuit will not endanger or damage the equipment.

A2.3.6. Where loss of supply pressure may result in damage to equipment, loss of accuracy, or danger or injury to personnel, means shall be provided to prevent operation under those conditions.

A2.4—Circuit Controls:

A2.4.1. When shifting from rapid traverse to feed, the starting position of the feed rate shall be maintained consistent with the type of service required.

A2.4.2. Pneumatic circuits shall be so designed as to minimize air consumption, the generation of heat and to conserve power.

A2.4.4. In each electrically controlled circuit, in case of solenoid failure means shall be provided to prevent damage to equipment, loss of accuracy, and danger of injury to personnel.

A2.4.5. Neutral valve - positioning controls shall be independent of and unaffected by adjustment of other controls.

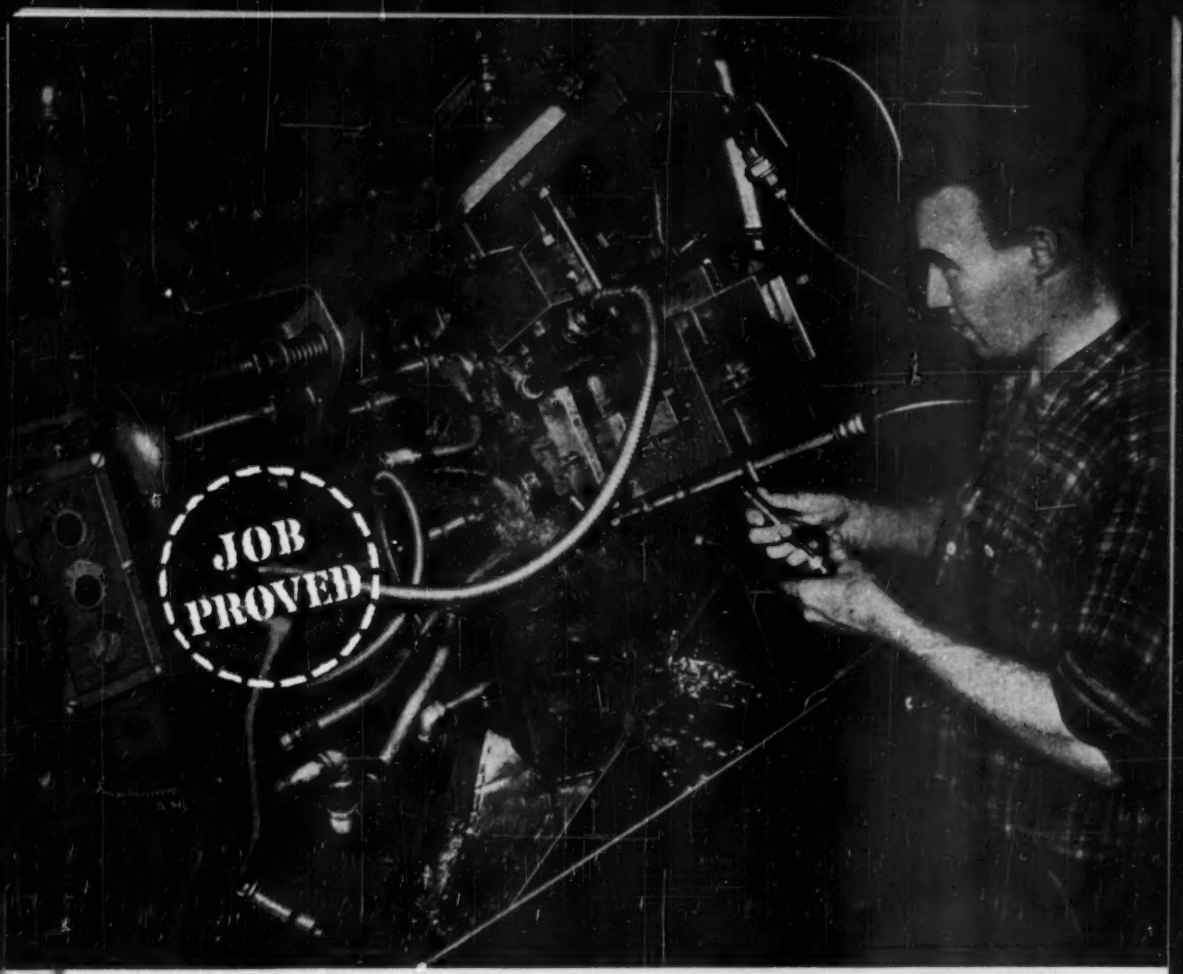
A2.4.6. Where practicable, feed and cycle limiting trip devices on mass-production equipment shall be arranged so that the feed distance can be set and sealed. After feed distance is pre-set, the control mechanism shall be adjustable as a unit.

A2.4.7. (*A*) Positive position stops shall be so designed that the dwell time will not be affected when positive position stops are reset.

(*B*) Positive safety stops for machine slides shall not be adjustable, but shall have provision for replacement.

A2.4.8. On industrial equipment operated at elevated temperatures or with toxic materials, the circuits shall be designed and located so that they can be serviced while equipment is operating under these conditions.

A2.4.9. Pneumatic circuits shall be designed, constructed and applied so



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JIC Pneumatic Standards . . . III

that unnecessary surge pressures are minimized at their source, and equipment shall be of adequate strength to withstand all operating pressures and surge pressures.

A2.4.10. Pneumatic circuits shall be designed to prevent uncontrolled movement of the equipment-operating devices in all phases of the equipment cycle including the idling phase.

A2.4.11. Pneumatic circuits shall be designed, and when necessary incorporate suitable dashpot devices, to compensate for load variations and their effect on the compressible actuating medium in relation to the intended service.

A2.4.12. Circuits having two or more heads, slides or actuators shall be provided with means to insure all units operating in proper relation regardless of load variation.

A2.5—Inclosures and Compartments

A2.5.1. For the purpose of these standards, an inclosure means a housing for pneumatic apparatus. A compartment means a space within the base, frame, or column of equipment.

A2.5.2. Automatic controls that might be damaged by exposure to dirt or dust or stock-moving equipment shall be protected and accessible.

A2.5.4. Doors and other parts of compartments for automatic controls shall be sheet steel not less than 14 USS gage, or cast metal not less than ¼ in. thick. Compartments for automatic controls shall be completely isolated from coolant, cutting or lubricating oil, chips, and dirt.

A2.5.6. (*A*) When inclosures for control devices are required, they shall have hinged covers which swing horizontally and shall be held closed with screws which require the use of a tool (wrench or screw driver) to remove.

(*B*) Means shall be provided for locking when requested by purchaser.

A2.5.7. The arrangement of inclosures for mounting controls shall permit ample room for maintenance.

A2.6—Mounting:

A2.6.1. (*A*) All controls shall be mounted to minimize the possibility of damage from floor trucks or other stock-moving equipment.

They shall be protected against falling objects and operator's accidental movements. No controls shall be placed in high heat areas or in locations subject to any harmful conditions unless properly protected.

(*B*) All manual controls shall be mounted within reach of the operator when in his normal operating position. Operator shall not be required to reach past revolving spindles or moving tools to reach manual controls. (See Paragraph A7.1.2).

(*C*) Automatic controls shall be located and protected to prevent inadvertent operation.

A2.6.2. All pneumatic controls shall be mounted 2 ft. or more above the bottom of the equipment, provided such mounting will not impair the proper functioning of the circuit. (This paragraph is written as a guide for all new machinery and equipment with the understanding that any deviation will be in accordance with Paragraph A0.2).

A2.6.3. Pneumatic control units shall be mounted in positions which provide complete accessibility to all units for maintenance without interfering with adjacent equipment.

A2.6.5. All industrial equipment shall incorporate an emergency stop control readily accessible from operator's normal position.

A2.6.7. Piping shall not be used as a means for supporting valves or equipment where vibration may prove detrimental to piping.

A2.6.8. Automatic controls shall be mounted as close to actuator as practicable, to keep working lines as short as possible, and to prevent waste of air and excessive actuating time lag. Mounting should be such that adherence to the above does not violate Paragraph A2.6.3.

A3—COMPRESSORS

A3.3.1. Compressors or subassemblies, including the compressors, shall be readily accessible for maintenance.

A3.3.2. Compressors shall be mounted where they are adequately protected from damage.

A3.3.3. When compressors and other apparatus are mounted inside a compartment or inclosure, sufficient space must be provided to assure complete accessibility to all units.

A3.3.4. Compressor compartments must be clean, free of moisture and adequately vented. All openings must be of sufficient height above the floor or be protected to such an extent that dirt, chips, coolant, etc., cannot enter, especially at such times as floor is swept or washed.

A3.3.5. Direct-coupled compressors must be properly aligned and securely mounted in such a manner as to assure alignment under normal operating conditions. When mounted inside column or base of equipment, foot-mounted compressors and driving motors shall be mounted on a sub-base of adequate strength which can be easily removed for servicing. The coupling must have adequate capacity to transmit the power required.

A3.5—Compressor Nameplates:

A3.5.1. The following information shall be permanently indicated on each compressor:

(*A*) Mfr's. name and address.
(*B*) Mfr's. identifying part number.
(*C*) Mfr's. serial number if any.

A data sheet or catalog providing complete information on speed limits, pressure range, delivery and horsepower required shall be provided with the specifications.

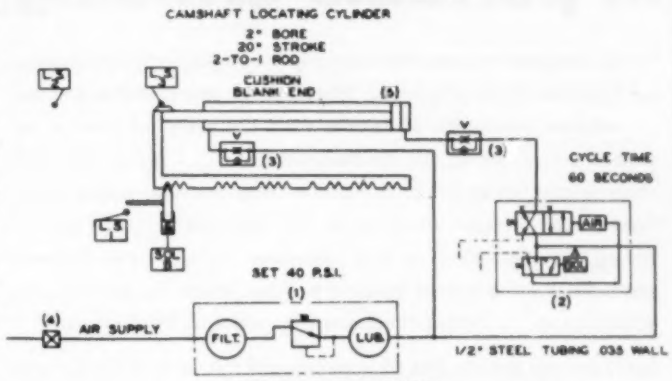
A3.5.2. Whenever a compressor is mounted so that its nameplate is not readily visible, a plate with duplicate information shall be provided where it can be readily seen. Such duplicate plate shall be marked "duplicate." The nameplate shall not be removed from the compressor.

A3.5.3. The direction of rotation of each compressor shall be clearly indicated on the compressor where it can be readily seen.

A3.5.4. All necessary valves for removal of any compressor while other compressors are still in operation shall be provided.

(To be continued)

SAMPLE PNEUMATIC CIRCUIT



SEQUENCE OF OPERATION

1. *Operator loads and clamps part manually and pushes cycle start buttons.*
2. *Solenoids "A" and "B" are energized, and when L.S.-1 is tripped solenoid "B" is de-energized.*
3. *Cylinder moves forward until wedge encounters next notch in rack.*
4. *Cylinder dwells at this point until electric timer times out and solenoid "B" is again energized and fixture moves to next notch in rack.*
5. *This cycle is repeated until L.S.-2 is tripped.*
6. *L.S.-2 energizes timer #2, when timer #2 times out solenoid "A" is de-energized and solenoid "B" is energized and cylinder returns, tripping L.S.-3, de-energizing solenoid "B", and completing cycle.*

Grinding Wheels

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For grinding performance that shows up in real production economies, use Simonds Abrasive Grinding Wheels on all your portable grinders . . . electric, pneumatic or flexible shaft. On every job they're top performers . . . biting into the toughest metal . . . giving fast stock removal and lasting productive action under the most severe conditions of use. Straight wheels up to 10″ diameter x 1½″ thick . . . flaring type cup wheels up to 6″ diameter . . . also cones, buzzers, pot balls of various sizes. Resinoid bonded wheels for speeds up to 9500 s.f.p.m. . . . Vitrified bonded for speeds to 6500 s.f.p.m.

Let's send you bulletin ESA 62, together with the name of the Simonds Abrasive Distributor ready to serve you.

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TALKING SHOP

Refreshed Magnesium

SURFACE WORKING of magnesium castings will provide a major increase in the fatigue strength, we learned at the recent meeting of the Magnesium Assn. G. H. Found of Dow and W. H. DuBois of Bendix Aviation told of methods they have developed and their application to airplane wheels. Shot peening with conventional shot destroys the surface but with 3/16 in. shot gives about ten times the fatigue life of unworked castings. Good results can also be obtained by working the surface with a roll that has a thin, flat edge.

Sling Shot—1950

THE DECLINE in woodlands is pointed up by the fact that that rural weapon, the sling shot, is now made commercially with a cast-aluminum frame, with steel balls for ammunition. Wheel-chair vets have adopted 'em as a sport. They have blankets hung against a wall as a backstop, use balloons as targets. In case you are named David, R. W. Hodge Co., 302 Commercial Bank Bldg., Pontiac 14, Mich., makes the sling for $3.95.

Daffynitions

OLD SOAK: subject for the police blotter. TOUPEE: false hood. STOMACH: waste basket. RELIGION: fire escape. X-RAY: preview of coming extraction. ELECTION FRAUD: pollution. GYMNASTICS: guided muscles. COMMUNISM: banned wagon. SPEED DEMON: gall of the open road. REBATE: changing worms on a fishhook. MOBILIZE: the kind a flirt has. HOARDERS: shelf-centered people. HAIRCUT: a load off the mind. EXPANSE: what your friends make fun at. COCKTAIL BAR: Where canned music covers the noise of canned customers.

60 Years of Drawing

E. W. BLISS CO., in moving offices from Toledo to the new plant at Canton, uncovered some old scrapbooks, in one of which was a clipping from *American Machinist* for October 23, 1890, picturing and describing a new Bliss drawing press. This was reproduced, side by side with the description, in our issue of Oct. 30, 1950, of the new SU-4 Bliss press —a design of just 60 years later—in a bulletin posted on company boards. Explains the 1890 yarn: "It is being discovered by manufacturers of metal goods of various kinds, that many articles which it has been thought could only be produced by casting them, or by expensive processes of forging, can be made by the process of cold drawing, provided the proper machine . . ." The press, with a built-in steam engine, was to be used for drawing kitchen sinks, could handle blanks up to 38x60 in., and was of the counterbalanced toggle type.

Wrong Seniority

DAVID DUBINSKY, great labor leader of ILGWU, tells one story that shows the weak spot in the seniority system. It seems that a labor leader went to a matrimonial agency, asked immediately, "Is this a union shop?" Upon being assured that it was, he inspected the samples and selected the picture of a luscious 25-year-old.

"I'll take her!" he announced.

"No, you won't; you'll take this one," said the manager, showing a picture of a 65-year-old dowager. "She's got seniority!"

Free-Lance Designs

ELGIN NATIONAL WATCH Company is turning to free-lance designers, some amateurs, for new watch styles. A. M. Fekula, merchandising director, reports several unusual new watchcase designs have already resulted, and more are coming. Best thus far was designed by a Mobile, Ala., advertising artist. The effort, according to Mr. Fekula, is to get away from European traditions.

Plain Planes

WHEN AN AIRPLANE is made of magnesium, it is not just a case of substituting materials. To be effective, the plane must be redesigned into a simpler structure, according to J. P. Donald Garges, chief engineer of East Coast Aeronautics. Because of its different properties, magnesium gives a better wing structure with a thick skin and less bracing than is conventional with aluminum. Stringers can be eliminated and fewer ribs are required. The result is considerably fewer parts and perhaps only half as many rivets and other fastening devices. This can make a reduction in the production cost to offset the higher material cost.

Quick Mill

TO MAKE small end mills for machining oil grooves in sleeve bearings, engineers in the Small and Medium Motor Divisions, GE, brazed Carboloy 883 blanks into the slot in the head of a 10-32 round-head screw. Grinding to shape finishes the job.

Little Precision

BEARINGS for aircraft instruments are stored in oil vats at GE Lynn until assembly, to prevent contamination by dust. Assemblies are made in constant-humidity, constant-temperature, dustproof rooms. Moving parts are usually to tolerances of 1/10,000 in., the balls for gyro bearings to two millionths. Balls, about half the size of BB shot, are also checked by microscope to eliminate those with surface defects. Small gyro parts weighing less than ¼ oz. are finished on 3-ton grinders set in 14-ft deep concrete blocks to avoid vibration. One pointer for an indicating instrument is ¼ in. long and 0.025 in. in diameter; some magnet wire is under 0.001 in. and so delicate it must be unwound from spools by an electronic drive. A 24,000-rpm motor, rated at 1/100 hp and golfball size, operates directional gyros for 60,000-hp high-speed planes, weighs less than 1 lb.

All these things are done to permit production of aircraft instruments about a quarter the volume of those used during World War II.

News of Metalworking

McGraw-Hill WORLD NEWS

TO BUILD ENGINES — Van Doorne's Automobile Factory, Eindhoven, Netherlands, will build American Hercules engines for all of Europe. Both gas and diesel engines of 50 to 150 hp for 4 and 6 cylinders will be built.

NEW TRANSMISSION—A French mechanic has patented a fully automatic car transmission, in which a pump supplies air pressure through the driveshaft proportional to engine speed. Air escapes through holes inside a series of rubber "hubs" in the gear box, inflating the hub of each gear in turn as the speed of the car rises.

OPEL UPS OUTPUT — West German Adam Opel Works at Ruesselsheim, a General Motors operation, plans to approximate its prewar annual production level of about 118,000 vehicles by 1952. This will require large-scale replacement of machinery.

NEW SOLDERING BIT — A fireproof soldering bit and a fireproof mastic smelter have been patented by Jan Prent, chief of the Amsterdam Public Works, based on the principle of encasing the flame and using only the heat.

GERMAN TRUCK DUE — Mercedes-Benz has added a new 145 hp diesel-engined truck to its production schedule at Gaggenau. Production of 65 per month will give Mercedes-Benz a total monthly output of 250 trucks.

CHARLES E. WILSON, president, General Electric Co., named to head overall production controls agency

You Can Expect Tougher Controls From New Single Production Agency

WASHINGTON — A single overall production controls agency was inevitable from the moment that President Truman decided, belatedly, to build our military strength more quickly. The defeat in Korea has forced this decision sooner than had been expected.

• **Controls on metals** and critical materials will be tougher from here on—and there will be less consideration given to political effects of hardships on particular companies or industries. General Electric's Charles E. Wilson will have far more authority than either Commerce Secretary Sawyer, or NPA chief Harrison had. Stuart Symington was the real top man over NPA, and frequently over-ruled that agency. Now with Mr. Wilson as top production controller, there is doubt cast on the future influence of Mr. Symington and NSRB.

Mr. Wilson's new agency will have the authority that formerly was spread among Commerce, Interior, and Agriculture. Interior may continue to administer controls over fuels and energy, and agriculture over food and fiber. But from here on, they will work under directives from Mr. Wilson, who has the final word on policy. This setup parallels that of the controls arrangement of World War II, when the Secretary of Interior was petroleum administrator for war, operating under authority delegated from Donald Nelson of WPB.

• **Look for sharper cutbacks** on materials controls, and a quicker use of bans on non-essential end products. Mr. Wilson will have the job of deciding, for instance, when and how you expand the "DO" rated order system into World War II's graduated priorities system.

Also, it will be up to him to decide whether a Controlled Materials Plan can be put into effect before mid-summer.

Here's a Summary of Production Controls

National Production Authority Regulations

Reg. 1 Prevents accumulation of excessive inventories of materials in short supply by limiting the quantities of such materials that can be ordered, received, or delivered.

Reg. 2 Establishes a system of preference ratings for defense work, the rating to be identified by the prefix DO and two digits identifying the procurement (DO-98 for production equipment, for example.) All DO rated orders have equal preferential status.

Reg. 3 Describes how and to what extent contracts and orders required to support either U. S. defense program or Canadian defense program may have DO rating. If rated order from U. S. manufacturer is placed with supplier in Canada, Canadian supplier may use DO rating to acquire materials in U. S.

National Production Authority Orders

M-1 Applies to 31 different steel-mill products, and designates the percentage of each for which the mill must accept defense orders. These percentages vary from 5% to 25% and are based on the average monthly shipments made during the first eight months of 1950.

M-2 Applies to both natural and synthetic rubber, limiting the quantity of the former which may be used in the manufacture of certain sizes of automobile, industrial and motor-cycle tires.

M-3 Prohibits the production, sale, delivery or purchase of columbium-bearing steel except on DO rated orders.

M-4 Prohibits the construction of 50 types of buildings for "recreational, amusement or entertainment purposes, whether public or private," if work had not been commenced before October 27, 1950.

M-5 Applies to 23 different aluminum forms and products and designates the percentage of each for which the producer must accept defense orders. These percentages vary from 15% to 40% and are based on the average monthly shipments made during the first eight months of 1950.

M-6 Applies to all types of carbon and alloy steels which a warehouse usually stocks, limiting the poundage which it may be required to deliver on a rated order "to any one customer, to any one destination, at any one time."

M-7 Applies to 24 forms and products of aluminum and limits their use for civilian manufacture or construction during each calendar quarter of 1951 to "65% of the average quarterly use" during the first half of 1950. Use of aluminum for maintenance, repair and operating supplies, however, may equal consumption for such purposes during the base period. Establishes a 60-day period of supply for aluminum inventory or the practicable minimum working inventory of Reg. 1, whichever is less.

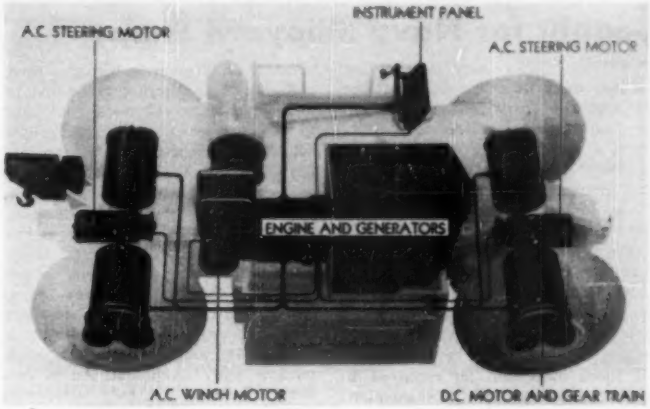
M-8 Makes the same inventory restriction for tin (excluding ores and concentrates).

M-9 Provides rules for placing, accepting, and scheduling rated orders for zinc.

M-10 Establishes specific inventory limitations for cobalt.

M-11 Provides rules for placing, accepting and scheduling rated orders for copper and copper-base alloys.

M-12 Describes how the copper remaining, after allowing for the requirements of national defense may be distributed and used in the civilian economy.



PULLING POWER sufficient to maneuver giant aircraft weighing 4,000,000 lb has been demonstrated by the Tournatow, made by R. G. LeTourneau, Inc., Peoria, Ill. Machine has no clutch, transmission, differential, uses its own diesel engine to generate power for all steering, forward, reverse and lateral movements, and for the winch. As control switches are closed on instrument panel, current generated by the alternating current generator flows to steering motors or to winch motor. As speed control lever at instrument panel is rotated, current generated by the direct current generator flows to each of four dc motors and to motor brakes simultaneously

No Delay Anticipated in Placing Orders for Industrial Mobilization

NEW YORK—One half the orders which must be placed to attain full industrial mobilization will be in the hands of contractors within nine months after M-day, it was indicated by Col. H. F. Sykes, director of production planning, Munitions Board. He estimated that it will take 18 months for peak mobilization to be reached.

Col. Sykes participated in a panel discussion on government contracts at the 55th annual Congress of American Industry, sponsored here Dec. 6-8 by the National Association of Manufacturers. Others on the panel were Maj. Gen. J. Matejka, director of production management and Rear Adm. Morton L. Ring, director of supply, Munitions Board, and Frank L. Roberts, chairman, Military Renegotiation Policy & Review Board.

Asked if competitive bidding procurement policies could handle a stepped up procurement program, Adm. Ring answered that "when the lack of control on the part of the individual businessman to quote a truly competitive price" is evidenced, "we are going to have to pass over to negotiation."

• **Successful procurement** requires skilled personnel, Adm. Ring noted. It will become necessary for business to spare key men, he said. "Some of the people who worked for the Army or the Navy during the war . . . have got to come back and get into harness again."

"We cannot afford in time of peace to employ men of the caliber that we need to make up our corps of negotiators in time of war . . . You have got to give us the very best people that you have," the Admiral declared.

• **Strategic materials** now in the defense stockpile will stay there until they are really needed for the common defense, declared Gen. Matejka. The materials will not be drawn upon to fill current defense orders.

The three-day program included sessions on production, conservation, inflation and security, labor relations, patents and research, and a round-table discussion on "Beyond Korea — What?"

The NAM elected William H. Ruffin, president and treasurer of Erwin Mills, Inc., Durham, N. C., as president for 1951.

Mergers and Purchases

• **Lima-Hamilton Corp.'s** assets and business became a part of Baldwin Locomotive Works on Dec. 4. Activities formerly conducted by both companies are now carried on under the name of Baldwin-Lima-Hamilton Corp., Eddystone, Pa.

• **Optimus Equipment Co.**, Matawan, N. J., has purchased Circo Products Corp., Cleveland, to be operated at Matawan as the Circo Div. Optimus is a subsidiary of Hanson-Van Winkle-Munning Co., Matawan.

• **Standard Coil Products Co., Inc.**, Los Angeles, has acquired from Square D Co. the latter's Kollsman Div., New York.

• **Cummins Portable Tools**, Chicago, a division of American Security (A.S.C. Corp.), Marion, Ind., has purchased Fred W. Wappat, Inc., Mayville, N. Y., to be operated by Cummins as the Fred W. Wappat Div.

• **Gaston Power Tools**, Harvey, Ill., has been sold by Ralph M. Gaston to new interests. The new firm is known as Gaston Power Tools, Inc., with Arthur O. Backen as president.

• **Capewell Mfg. Co.**, Hartford, Conn., has acquired V-Mac Industries, Inc., Guilford, Conn., manufacturers of pipe threading, cutting and reaming tools. Equipment and employees are being moved from Guilford to Hartford.

• **Food Machinery & Chemical Corp.**, San Jose, Calif., has purchased Propulsion Engine Corp., Kansas City. FMC will operate the newly acquired company as part of its Bolens Products Div., Port Washington, Wis.

• **Ferroxcube Corp. of America**, New York, has been formed jointly by Sprague Electric Co., North Adams, Mass., and Philips Industries, Inc., Hartford, Conn.

• **Diamond Alkali Co.**, Cleveland, has purchased the chromic acid business of E. I. duPont de Nemours & Co., Wilmington, Del. DuPont will continue to manufacture the product at its Philadelphia plant, with Diamond taking over distribution on Jan. 1, 1951.

Ship Conversion Job Tops Navy Contracts

Bath Iron Works, Bath, Maine, conversion of two destroyer escorts, $2,000,000.

S. Volpe & Co., Inc., Boston, communication facilities at Corea, Maine, $162,900.

General Electric Co., Schenectady, N. Y., tubes, electron, $262,500.

Chatham Electronics Corp., Newark, N. J., tubes, electron, $294,750.

Raytheon Mfg. Co., Waltham, Mass., tubes, electron, $217,500.

Machlett Laboratories, Inc., Springdale, Conn., tubes, electron, $627,000.

Gibson Mfg. Corp., Longmont, Colo., trucks, fork, gasoline, $689,795.

Picker X-Ray Corp., New York, X-ray units, mobile, photo fluorographic, $171,517.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., generators and regulators, $232,428.

Snow-Nabstedt Gear Corp., Hamden, Conn., repair parts for reverse & reduction gears, $111,783.

R. G. LeTourneau, Inc., Peoria, Ill., mobile airplane crash crane, $100,000.

Okonite-Callender Cable Co., Inc., Passaic, N. J., cable Mark 1, 2 and 3 assemblies, $450,000.

Way-Wolff Assoc., Inc., New York, boilers, hot water heating, $109,496.

Walter H. Eagan Co., Inc., Philadelphia, battery cooling water pumping units, $99,449.

Times Facsimile Corp., New York, rental of facsimile equipment for transmission and/or reception of weather maps, $150,000.

Cla-Val Co., Alhambra, Calif., remote operation control globe valves, $100,000.

Anaconda Wire & Cable Co., Hastings on Hudson, New York, cable, $440,857.

Electro Engineering Products Co., Inc., dynamotors, $126,087.

Birtman Electric Co., Rock Island, Ill., vises, combination, bench & pipe — machinists, $120,983.

Reynolds Metals Co., Louisville, Ky., aluminum alloy sheets, $167,144.

Grove Regulator Co., Oakland, Calif., regulators, valves & repair parts, $199,577.

Worthington Pump & Machinery Corp., Harrison, N. J., repair parts for compressors and pump turbines, $386,795.

Hackney Wagon Co., Inc., Wilson, N. C., hand carts, $283,198.

King Machine Tool Div., American Steel Foundries, Cincinnati, vertical boring & turning machines, $161,214.

Commercial Engineering Co., Inc., Washington, D. C., repair parts for oil clarifiers, $187,794.

Buffalo Pumps Inc., Buffalo, N. Y., repair parts for pumps, $260,740.

U. S. Thermo-Control Co., Minneapolis, Minn., refrigerators, $147,980.

Bay City Shovels, Inc., Bay City, Mich., spare parts, $130,291.

Ideal Windlass Co., E. Greenwich, R. I., removable horizontal drum streaming winches, $150,000.

Fairbanks, Morse & Co., Chicago, generator sets, $350,000.

Latest Manufacturing Techniques Sought for Navy Shipyard Shops

WASHINGTON—Latest information on manufacturing techniques proved profitable in private industry will be placed at the disposal of shipyard commanders through Navy's creation of an Industrial Engineering Division which will systematically explore production operations at all Navy shipyards, shop by shop.

Capt. R. E. W. Harrison will be in charge of the new division.

A trade specialist highly trained in the most up-to-date practices applicable to each of the various types of shipyard shops will be hired. Each of these men will be required to make a study and a subsequent constructive action report centered around such principal elements as:

(1) Recommendations for modernization of equipment, improved machine tool specifications, costs of replacements, work handling and work transportation facilities;

(2) Evaluation of each shop's contribution to the overall productive efficiency of the shipyard;

(3) Evaluation of the effect of recommended improvements in terms of (a) reduction in manhours necessary to accommodate an agreed-on work load, and conversely, what percent of extra work could be produced with the same manhours of labor; (b) improvement in quality of work produced, as to accuracy, finish, durability, and adaptability; (c) reduction in required floor space; and (d) improved safety.

• **Aim is to improve** work management in all shipyards, bringing men and machines completely up-to-date to meet the current work load, and to meet any emergency which might be created by a hostile act on the part of a potential enemy.

This is no wartime emergency move to handle a special situation. Positions now being created in the division are regarded by top Navy management as permanent. They will be filled by competent industrial engineers and trade specialists who can establish and maintain a production efficiency record comparable with that demanded by private industry.

One requirement: specialists must have at least ten years' experience as a supervisor in a shop of a successful private manufacturer. And he must have a comprehensive knowledge of thoroughly modern practices pertaining to shipyard work.

Aluminum Output to Increase

CHICAGO — Producers of primary aluminum in the U. S. are negotiating for facilities which provide for a total expansion of perhaps a billion pounds, declared Richard S. Reynolds, Jr., president, Reynolds Metals Co., Richmond, Va., speaking at a Production Conference of American Management Association, held here Dec. 11-12.

Aluminum facilities of the nation are producing over 1.4 billion lb annually, he said, more than four times as much as at the beginning of 1940.

Bulk of Army's Major Metalworking Contracts Awarded

United Motors Service Div., GMC, Detroit, regulators, generator, $177,726; generator repair kits, $69,188; starter, screw, housing coil stud, etc., $52,741; spotlights, with sealed beam unit assembly, $38,000.

Kenworth Motor Truck Corp., Seattle, cage, hub, knuckle, front axle, $122,379; carrier, differential, $106,400; cover, bearing, fork, $74,816; bolts, cage, retainers covers, pans, disc, pins, $26,362.

Federal Motor Truck Co., Detroit, misc. carriers and end assemblies, $122,164; differential, transfer assembly, flange, $270,420; hub, nut, shaft, $94,097; bearing set, $50,096; yoke $53,793; kits, repair, fan overhaul, transmission assembly, $204,672.

Guide Lamp Div., GMC, Anderson, Inc., lights, $168,944; sleeve, assembly, headlight, $41,772.

Buffalo Bolt Co. Div., Buffalo Eclipse Corp., North Tonawanda, N. Y., bolts, $170,333.

Lamson & Sessions Co., Cleveland, bolts, $95,326.

Surette Storage Battery Co., Inc., Salem, Mass., batteries, $142,610.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., plugs, nuts, brackets, stud washers, screws, levers, valves, etc., $114,129; bushings, gaskets, etc., $262,436; pistons, cups, cylinders, valves, $71,582; carburetors, washers, valves, $45,905.

Austin Metal Products, Inc., Detroit, windshield assemblies, $278,000.

Cannon-Kocka, Inc., Cleveland, misc. pins, $101,897.

United Auto Parts Co., Kansas City, Mo., body, weapons, $367,500.

Continental Motors Corp., Detroit, engine assemblies, $968,700; misc. valves & sprockets, etc., $30,170.

Algonac Mfg. Co., Algonac, Mich., cab closures for trucks, hard tops, $306,489.

Pentagon Mfg. Co., Detroit, cab closures for trucks, hard tops, $208,335.

Metro Engineering & Mfg. Co., Detroit, cab closures for trucks, hard tops, $212,287.

Clark Cable Corp., Cleveland, connectors & cables, $108,945; harness, wiring, $123,700.

Diebold, Inc., Canton, Ohio, door stops, holders, $123,547.

Butler Mfg. Co., Minneapolis, water tanks, $131,650.

Long Mfg. Div., Borg-Warner Corp., Detroit, disk, engine clutch, $122,357; platen, press, $178,982.

Motive Parts Co. of America, Inc., Chicago, manifolds, nozzles, $154,822.

Allis Chalmers Mfg. Co., Milwaukee, misc. covers, bushings, etc., $110,468; overrunning, clutch, $53,009; yokes, springs, gaskets, washers, plugs, $78,502; pumps, pedals, hooks, precleaners, $91,549.

Chrysler Corp., Detroit, bolts, brackets, etc., $146,659; filter, insulator, bracket, plate, etc., $51,445; plate, joint, $28,306; bushings, bearings, $26,360; cases, covers, repair kits, differential, $166,761; kits, replacement, engine fuel, $115,949.

Bay Engine & Parts Co., San Francisco, section valves, guide, $196,312.

National Wholesalers, Inc., Los Angeles, regulators and kits, $505,201.

Willys-Overland Motors, Inc., Toledo, cargo trucks, ¾ ton, 4x4, $266,305; kits, $59,800; kits, universal joint, manifold assembly, pulleys, bushings, etc., $28,549.

Transmission Gear Sales, Inc., Chicago, gears, $185,100.

Detroit Bolt & Nut Co., Detroit, screws, $103,595.

Chevrolet Motor Div., GMC, Detroit, shoes, with lining assembly, $135,982.

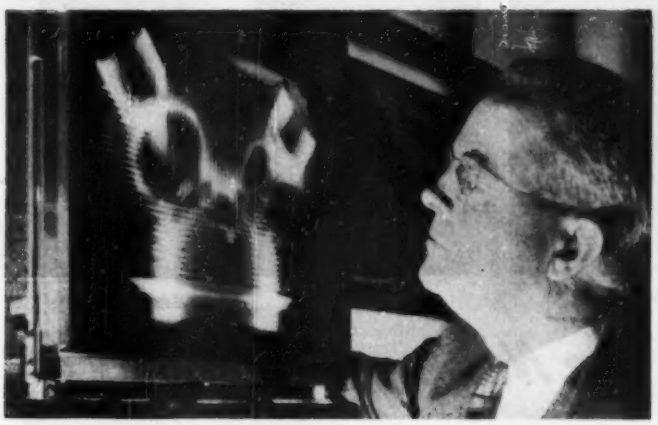
International Spare Parts Corp., Long Island City, N. Y., flywheels, $127,688.

Ernest Holmes Co., Chattanooga, Tenn., cases, transmission, $114,665.

Ford Motor Co., Washington, D. C., buses, $1,986,813.

B. F. Goodrich Co., Akron, Ohio, strip-S shoe, shoe assembly, $5,704,868.

U. S. Rubber Co., Detroit, strip-S shoe, shoe assembly, $5,278,133.



RADIOGRAPH, made with high-voltage X-rays, of a casting for an airplane engine is examined here by Dr. Ernest E. Charlton, head of the X-Ray Generation, Radiography & Radiation Therapy Div., General Electric Research Laboratory. With X-rays up to 10 million volts, steel castings a foot thick may be examined for defects before they are put to use

"German Living Standard Invites Communism"

NEW YORK—The German working man's living standard, when compared with that of the factory owner or business proprietor, makes the country ripe for communism, declared Jack Kleinoder, general manager, John Volkert Metal Stampings, Inc., Queens Village, N. Y., who recently returned from Europe.

The factory or clerical worker is greatly underpaid, he said, and "there is no relation between earnings and prices." He cited some price examples:

Table model radios, 300 marks; bicycle, 150-200 marks; man's shirt, 20-30 marks; man's suit, 180-200 marks; shoes, 20-30 marks; pound of ham, 250 marks; pound of butter, 200-300 marks. In U.S. money, a chocolate bar costs $1.30-$1.60.

Earnings of the German worker are about 10% less in marks than earnings of American workers are in dollars, he pointed out.

Sanitary conditions are of the most primitive type, he said. Most people live without a bath tub or even a decent sink. A great number of people do not know what it means to have a sanitary water flush toilet.

The attitude of many German shopowners and bosses is that there is no reason to change such conditions, that the people have all they are entitled to.

North American Gets $9 Million AF Award

North American Aviation, Downey, Calif., modification of aircraft, manufacture of modification kits, $226,500; misc. assemblies and subassemblies for aircraft, $9,000,000.

Minneapolis-Honeywell Regulator Co., Minneapolis, turbosupercharger regulator systems, $621,689; gyro controls, calibrators and brackets, $245,350.

Douglas Aircraft Co., Inc., Santa Monica, Calif., spare parts for aircraft, $121,914.

Lockheed Aircraft Corp., Burbank, Calif., retrofit kits, $1,000,000.

Press Wireless Mfg. Co., Inc., West Newton, Mass., magnetic paper recorders, $80,523; voltage dividers, $41,998.

General Electric Co., Schenectady, N. Y., regulators, $125,565.

Fairchild Camera & Instrument Corp., Jamaica, N. Y., periscope, radar recording camera, $72,387; misc. assemblies and subassemblies, $95,278.

Solar Aircraft Co., San Diego, Calif., machinery and equipment, $875,000.

Norma-Hoffman Bearings Corp., Stamford, Conn., roller bearings, $165,450.

Marlin-Rockwell Corp., Jamestown, N. Y., ball bearings, $165,880.

American Gas Accumulator Co., Elizabeth, N. J., connector-cable, $814,046.

Linde Air Products Co., Div. Union Carbide & Carbon, New York, acetylene and freon cylinder assemblies, $136,200.

Marman Products, Inc., Los Angeles, Marman clamps and couplings, $150,093.

Lear, Inc., Grand Rapids, Mich., actuator assemblies & screw jacks, $280,738.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., wheel and brake assemblies, $265,625.

Revere Corp. of America, Wallingford, Conn., fuel flow transmitters, $192,800.

Goodyear Tire & Rubber Co., Akron, Ohio, airplane castings & tubes, $367,200.

General Textile Mills, Inc., New York, helmets, $312,600.

United States Rubber Co., Detroit, airplane casings & tubes, $220,332.

Harris-Seybold Co., Cleveland, printing presses, $602,539.

Lockheed Aircraft Corp., Burbank, Calif., spare parts for aircraft, $123,542; mobile training units, $50,000.

Jack & Heintz Precision Industries, Inc., Cleveland, generators, $240,000.

Sheroid Crystal Corp., Lawrence, Kans., crystal units, $231,000.

Eastern Rotocraft Corp., Willow Grove, Pa., tie down devices, $392,179.

Cappel, McDonald & Co., Dayton, sustenance kits, $266,995.

Clark Metal Products, Inc., Fairfield, Conn., dehydrator pumps, $130,810.

Ellwood Ivins Steel Tube Works, Inc., Philadelphia, seamless steel tubing, $126,183.

Steelcraft Mfg. Co., Rossmoyne, Ohio, stand assembly, aircraft engine, $100,220.

Arnolt Corp., Warsaw, Ind., load platforms, $234,162.

By Detroit Ordnance-Tank Automotive Center

Ohio Rubber Co., Willoughby, Ohio, strip-8 shoe, shoe assembly, $8,378,265.

Goodyear Tire & Rubber Co., Akron, strip-8 shoe, shoe assembly, $12,546,111.

Firestone Ind. Products Co., Akron, strip-8 shoe, shoe assembly, $12,546,111.

Gar Wood Industries, Inc., Wayne, Mich., shaft, cover, carrier, rail winch assembly, $184,284.

Stewart-Warner Corp., Chicago, speedometer assembly; core, table assembly, $236,686.

Electric Auto-Lite Co., Toledo, lights, head rotor, distributor starter assembly, $177,205.

Automotive Specialty Corp., Brooklyn, N. Y., coils, ignition assembly, $108,750.

Autocar Co., Ardmore, Pa., screw, cover, shaft, hub, fork, gasket, rod, clip, etc., $350,808.

Lipe-Rollway Corp., Syracuse, N. Y., disc. clutch assembly, $271,831.

E. A. Wildermuth, Inc., Brooklyn, N. Y., carburetor repair kits, $212,642.

International Spare Parts Corp., Long Island City, N. Y., rods, $113,279.

Perfection Stove Co., Cleveland, power plant kits for trucks, $881,570.

United Motors Div., GMC, Detroit, starter engines, $131,996.

Eaton Mfg. Co., Valve Div., Detroit, valves, engine, exhaust, $250,900.

Wayne Fdry. & Stpg. Co., Detroit filters, tank assembly, $108,756.

Zaio Mfg. Co., Cleveland, pins, $116,957.

Coffing Hoist Co., Danville, Ill., hoists, chain, $106,265.

Monroe Auto Equipment Co., Monroe, Mich., shock absorbers, $247,176.

Liggett Spring & Axle Co., Ponogahela, Pa., springs, front, assembly, $171,000.

General Cable Corp., Philadelphia, wire, $8,092,516.

American Metal Products Co., Inc., Bridgeport, Conn., liner for deep cavity loaded shells, $209,145.

Stile-Craft Mfrs. Inc., St. Louis, bottom closing screw assembly for fuzes, $426,249.

Hammarlund Mfg. Co, New York, radio receivers, maintenance parts, $495,802.

Massachusetts Institute of Technology, research in fields of electronic physics, $600,000.

Hallicrafters Co., Chicago, radio sets, $1,393,775.

Remler Co., Ltd., San Francisco, cheat set group, $382,200; tabular list of parts, $388,824.

Acme Steel Co., seals & strapping, $391,201.

Lormar Instrument Co., Brooklyn, N. Y., spare parts for telescopes, $110,619.

King-Seeley Corp., Ann Arbor, Mich., renovation & conversion of mech. time fuze, $876,000.

Behr-Manning Corp., Troy, N. Y., abrasive cloth, aluminum oxide, $190,370; crocus cloth, $124,250.

Union Hardware Co., Torrington, Conn., tool combination, $404,850.

Wire Novelty Mfg. Co., Shelton, Conn., tools, assembly & disassembling, $111,000.

Walter English Co., Columbus, Ohio, No. 2½ cans, $144,397.

Mullins Mfg. Corp., Salem, Ohio, development & production of steel 3 in. 70 cal. cartridge cases by cold extrusion method, $158,000.

Eastman Kodak Co., Rochester, N. Y., range finders, $2,400,000.

Waterbury Farrel Fdry & Mach. Co., Waterbury, Conn., priming machines, screw machines, trimming machine, $112,622.

Ohio Steel Foundry Co., Lima, Ohio, castings, alloy steel, rough machines, breech ring, for 76mm gun.

Firestone Tire & Rubber Co., Akron, Ohio, spare parts for 57mm rifle, $282,500.

Manufacturers Thread Grinding, Eatontown, N. J., spindle, traversing, for 60mm mortar M2; ring, steel, for 60mm mortar M2; 16 items of special tooling, $158,400.

Investment Casting Co., Newark, N. J., trap & spacer assembly for 3.5 in. rocket, $98,500.

Henry D. Sharpe, Jr.

Paul R. Hatch

Frederick U. Conard

Edward P. Gillane

Names in the News

Henry D. Sharpe, Jr., has been elected a vice president of Brown & Sharpe Mfg. Co., Providence, R. I. **Paul R. Hatch,** general sales director, has been elected an assistant secretary. Mr. Sharpe was elected an assistant secretary in 1948, and a director in 1949. Mr. Hatch joined the firm in 1927, was named head of small tool sales in 1941, and was made head of the sales department in 1947. He continues as general sales director. **Julian G. Tabor,** in charge of the Hartford office since 1920, has retired after 45 years of service. **Herbert Richardson** of the Philadelphia office succeeds Mr. Tabor as Hartford representative. Henceforth all Connecticut sales will be handled at Hartford.

Charles D. Perrine, Jr., specialist in missile homing guidance systems, has joined the electronics and guidance section in Consolidated Vultee Aircraft Corp.'s San Diego Div. Engineering Dept. He was manager, Electronics Dept., Guided Missiles Div., Fairchild Engine & Airplane Corp., Farmingdale, N.Y.

John W. Thompson has been named product manager, Carpenter Steel Co., Reading, Pa. **William R. Staples** has been named assistant to the manager of sales, Alloy Tube Div., Union, N.J. **Paul E. Kelly** succeeds Mr. Staples as West Coast representative.

O. P. Robinson has been named manager, Pittsburgh district sales office, Cutler-Hammer, Inc., Milwaukee, succeeding **T. S. Towle,** retired. **M. C. Larson** has been named manager, Baltimore sales office, succeeding **R. A. Haworth,** named Dallas district sales manager.

E. J. Rathsack has been named secretary and engineer in charge of production, Kenworth Metal Stamping Co., Milwaukee.

Harold H. Dice has been named administrative assistant, Electro-Motive Div., General Motors Corp., at La-Grange, Ill. **John H. Anderson** succeeds Mr. Dice as director of test and inspection.

Gordon Porterfield has returned to the New York office of Baldwin Locomotive Works, Philadelphia, as sales representative for hydraulic presses, power tools, hydraulic turbines, and Pelton products.

Ronald C. Hinman has been named sales engineer, Western Gear Works, assigned to aircraft industry activities at the Lynwood (Los Angeles County) plant.

Dr. H. K. Ihrig has been elected vice president in charge of research, Allis-Chalmers Mfg. Co., Milwaukee. Dr. Ihrig has resigned as vice president and director of laboratories, Globe Steel Tubes Co. **Philip C. Neumann** and **William C. Campbell, Jr.** have been named sales representatives in the Pittsburgh district office. **George A. Wampler** has been named manager of the Chicago warehouse sales unit, newly established at 500 E. 27 St. **Richard T. Stafford,** assistant to the executive vice president, General Machinery Div., has retired.

John T. M. Frey has been named assistant manager, New York Branch, Manhattan Rubber Div., Raybestos-Manhattan, Inc., Passaic, N.J. **Lamar S. Hilton** has been named assistant sales manager, Abrasive Wheel Dept.

Frederick U. Conard, president and general manager of Niles-Bement-Pond Co., West Hartford, Conn., has also been named president of Potter & Johnston Co., Pawtucket, R. I., a wholly owned subsidiary of N-B-P. He succeeds **Clayton R. Burt,** retired. Mr. Burt is a former president and former chairman of N-B-P. **Edward P. Gillane** was elected vice president and general manager of Potter & Johnston, with **J. Potter Cunningham** continuing as vice president and sales manager.

Elmer W. Krueger, operation manager of Cleveland Pneumatic Tool Co., has been elected to the board of directors. He was named operations manager in 1948.

Huntly M. Campbell has been named assistant general sales manager, and **Edgar N. Rousseau,** assistant to the general sales manager, Western Brass Mills Div., Olin Industries, Inc., East Alton, Ill.

C. A. Hubley has been named manager, and **Ken C. Boalen** field engineer of the newly opened Michigan Sales Div., Cleveland Industrial Tool Co. The new office is at 10526 Grand River Avenue, Detroit. For the past six years both Mr. Hubley and Mr. Boalen have been working in the Detroit territory for the Cleveland office.

Henry L. LeMay has been named Chicago district manager, Mid-West Abrasive Co., Owosso, Mich.

Jerry Singleton, assistant manager, Pressed Metal Institute, has resigned effective Jan. 1, 1951. Mr. Singleton, who has been with PMI in an executive capacity since 1947, is continuing in association work, his connection to be announced later.

Milton G. Peck

William J. Greene

Robert A. Miller

Alexander Zeitlin

Milton G. Peck has been named sales manager, Clark Equipment Co. Battle Creek, Mich., for the recently introduced line of Clark powered hand trucks. He was formerly with Yale & Towne in Philadelphia as sales manager, Industrial Truck Div.

Oliver Smalley, president, Meehanite Metal Corp., was recently awarded the Gold Medal of the Gray Iron Founders' Society of America for his "outstanding contributions to the scientific advancement of the gray cast iron industry."

Carl W. Nedderman has been elected vice president, Edward Valves, Inc., East Chicago, Ind. He joined the firm in 1948. Previously he was president and general manager, Universal Camshaft Co., controller of Muskegon Motor Specialties Co., and director of budgets of DeVilbiss Co., Toledo.

Francis I. Taylor, Jr., has been named New England sales and engineering representative, Industrial Castings Div., Hunt-Spiller Mfg. Corp., Boston. He was recently with Teiner Engineering Corp.

L. R. Wanner, formerly manufacturing superintendent, has been named plant manager in charge of plastics operations, Parts Div., Sylvania Electric Products, Inc. Before joining the Parts Div. staff in 1948 he was with Hugh H. Eby, Inc., Philadelphia.

George R. Siegrist, executive vice president, treasurer and director of Acheson Colloids Corp., Port Huron, Mich., has retired after 30 years of service because of ill health. **Alfred E. Emms,** plant superintendent, has retired after 47 years. **Raymond Szymanowitz** was elected a director of Acheson Colloids Ltd., London.

William J. Greene, vice president and director of sales, L. S. Starrett Co., Athol, Mass., was recently elected a director of Motor Equipment Manufacturers Association for a three-year term, 1951-1953. He has also been named to the executive committee of the American Supply & Machinery Manufacturers Association.

Robert A. Miller has been named sales manager, Gear Coupling Div., Sier-Bath Gear & Pump Co., Inc., North Bergen, N. J. He was previouly advertising manager for the company and assistant sales manager of the division.

W. P. Kirk, who on Oct. 31, 1950 retired as vice president of Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford, Conn., has not announced his future plans. Until further notice, his address will be his residence, 60 Beverly Road, West Hartford.

George A. Hinckley has been named sales manager, New York City factory branch office of Automatic Transportation Co., Chicago. He has been with Automatic for several years, most recently with the sales department at the factory.

Alexander Zeitlin has been named vice president of Hydropress, Inc., and Loewy Construction Co., Inc., both New York. He will be in charge of the new rolling mill and heavy press program initiated by the U.S. government and various firms.

Walter C. Foote has been named sales manager, Dearborn Gage Co., Dearborn, Mich.

John W. Pennington, former staff engineer for Caterpillar Tractor Co., has been named chief engineer, Piston Ring Dept., Koppers Co., Inc., Pittsburgh. **J. N. Forker,** vice president and general manager, Tar Products Div., has retired, being succeeded by **Fred C. Foy,** who has headed Koppers' Sales Dept.

Harold G. Williams has been named manager, Beryllium Copper Div., Lee Mechanical Laboratories, Brooklyn, a newly formed division of Lee Spring Co. He was formerly chief metallurgist, Instrument Specialties Co.

Ellis C. Wester has been named sales manager, Cutting Tool Div., Charles H. Besly & Co., Chicago. **Hal Seger** has been named manager of drill and reamer sales.

OBITUARIES

Franklin Johnston, 72, secretary and purchasing agent, Moline Tool Co., Moline, Ill., died Nov. 12. He had been with the firm for 40 years.

Charles Englehard, 83, president of Baker & Co., New York, refiners of precious metals, died Dec. 1.

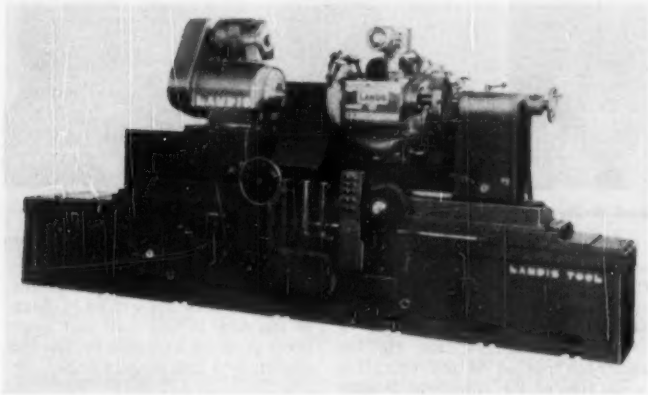
Charles H. Woolley, 44, assistant manager, Proposition Dept., Babcock & Wilcox Co., New York, died Nov. 11.

Walter H. Hermann, 71, president of Hermann Mfg. Co., Lancaster, Ohio, died Nov. 8.

Louis A. Mayle, founder of Fremont Tool & Die Co., Fremont, Ohio, died Nov. 17. He had retired from the firm in 1946.

Frank J. Itts, 54, assistant supervisor of employment, Youngstown (Ohio) district of Youngstown Sheet & Tube Co., died Dec. 3.

New Shop Equipment



Universal Grinder for Large Work Operates From Front or Rear

Large-diameter work such as turbine shafts, large motor armatures, and similar parts can be handled by this grinder.

Known as the CHW, the wheelbase, headstock, and work table may be swivelled. Wheelbase travel permits grinding diameters from zero to max. capacity.

An 18-in.-diameter grinding wheel with a 2-in. face is standard equipment. Its spindle runs in Michrosphere bearings, which operate with a very small clearance. This is said to give a short spark-out period and quick response to wheel feed.

Dual controls are available so that the machine may be operated from the front or rear, depending on the shape of the workpiece.

Carriage ways are extra-wide, providing stability. The hydraulic traverse is adjustable to any desired speed between 3 and 130 ipm. The swivel table is adjustable for grinding tapered work.

A 3-hp dc motor is used for the work drive, with infinitely adjustable speeds from 8 to 95 rpm. The headstock may be swiveled 90° for face grinding.

An additional grinding wheel may be carried on the right-hand end of the spindle, plus an internal grinding fixture may be attached to the front of the headstock. This internal spindle is driven directly from the 7½-hp wheel-drive motor.

Sizes are available to swing 24-, 30-, 36-, 42-, and 48-in.-diameter work. Lengths between centers are 36, 48, 72, and 96 in.

Landis Tool Co., Waynesboro, Pa. ..
(MORE DATA? CIRCLE FYI 30, p. 147)

50-Ton Hydraulic Press has Adjustable Multiple-Ram Action

The 50-ton Multipress is said to extend the range of standardized, self-contained hydraulic presses in this line beyond the widely used units of 1- to 35-ton capacity. It has a 15-in. stroke, 24-in. daylight opening, and a work surface of 31x19½ in., all of which provides more die space.

Approach of the ram to work is variable and can be preset at any speed desired up to a maximum of 290 ipm, with pressing speeds up to 145 ipm. Approach and pressing speeds are independently adjustable, permitting rapid traverse with slow entry of punch into dies. Other operational factors that can also be preset include: ram stroke length and pressure. Either pressure or distance reversal is also a feature of all models of the 50-ton units.

The Denison Engineering Co., Columbus, Ohio
(MORE DATA? CIRCLE FYI 31, p. 147)

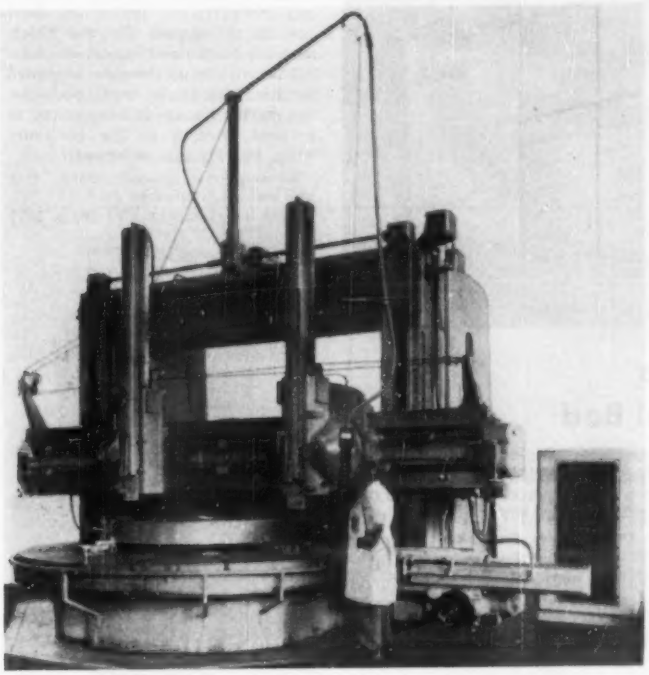
Portable Vacuum Cleaner Has Advantages of Larger Machines

Identified as the No. 15, this cleaner is a 1½-hp machine which will operate one 35-ft. length of hose. Overall dimensions are compact, permitting almost unlimited maneuverability of the cleaner in narrow aisles or congested areas. Width is 21½ in.; length, 40½ in.; and height 43¼ in.

Other advantages are: The dust container has adequate capacity for continuous service. Inlet to the dust separator is tangential; dust enters the separator below the bag plate level, to prevent any direct impact on bag.

Appliance Div., U. S. Hoffman Machinery Corp., 105 Fourth Ave., New York 3, N.Y.
(MORE DATA? CIRCLE FYI 32, p. 147)

Materials and Parts



Cincinnati-Hypro Boring Mill Features Pendant-Control Shift

Elimination of mechanical shift levers from the front and side of this 12-ft vertical boring and turning mill simplifies operations. Control functions are handled through a pendant station and solenoid that activates a hydraulic shift mechanism. The clutch and gear train are said to respond immediately to the controls.

Two table speed ranges are available; obtained through a 50-hp adjustable-voltage drive motor. Intermediate shifting of speeds is accomplished entirely through the pendant.

Another development is installing independent traverse motors in the rail and side heads. Separate motors mean fewer gears and spline shafts and consequent reduction of maintenance. Greater flexibility of control is another advantage.

A new feedbox provides 16 feeds between 0.004 and 0.750-ipm. Independent feed reverse for the saddle and ram means that either of these components can be moved up or down, in or out, individually.

Three circular non-metallic bed ways are used between the bed and table surfaces. These are claimed to offer improved contact. Helical rack and pinions drive the rams and the rail and side heads.

Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

(MORE DATA? CIRCLE FYI 33, p. 147)

Pre-shaped steels made from cold-drawn bar stock are being made to fit specific uses. They are claimed to virtually eliminate machining operations. They are available in a wide variety of sections and analyses.

A. Milne & Co., 745 Washington St., New York 14, N.Y.

(MORE DATA? CIRCLE FYI 34, p. 147)

... INCLUDING

Toolroom lathe has a deep cross-section, cast in semi-steel, to insure proper rigidity ... page 140

Universal grinder positions the wheel hydraulically through a control lever ... page 141

Planer-miller carries 5 working heads, and has non-metallic, force-lubricated ways ... page 142

Wheel dresser is capable of dressing a series of angles with all locations held ... page 144

Press for rubber-pad forming uses automatic, hydraulically actuated loading tables ... page 154

Spotwelder does work indexing and spacing automatically on any curved surface ... page 156

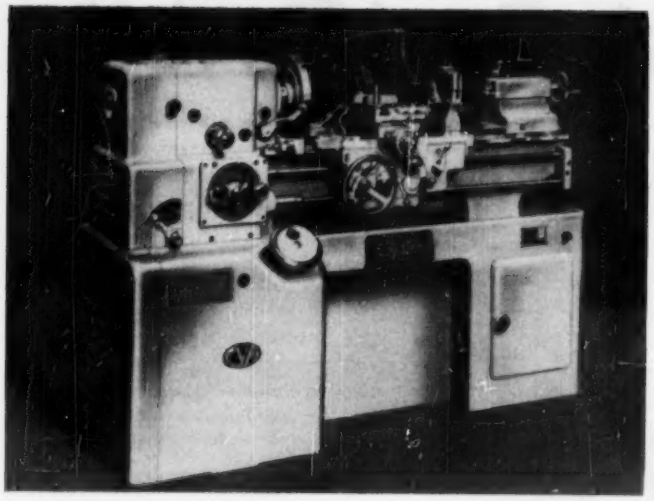
Mounting press for railroad car wheels can be handled by a single operator ... page 158

NEW BULLETINS for your Shop Library, including a 43-page manual on welding design and equipment ... pages 147 and 148

... and in January 8

Boring mill is equipped with a hydraulically controlled tracer and a swivel turret head.

Die-making machine has fully enclosed variable-speed transmission providing 7 to 350 strokes per min.



CVA Toolroom Lathe Has Rigid Semi-Steel Bed

Swing over bed	12 1/2 in.
Center distance	30 in.
12 spindle-speeds range	25-1645 rpm
Max. collet capacity	1 in.
Feed range, saddle	0.002-0.061 ipr
Feed range cross slide	0.001-0.030 ipr

The bed of the No. 1A has a deep cross-section cast in semisteel. The ways are flame-hardened and precision ground.

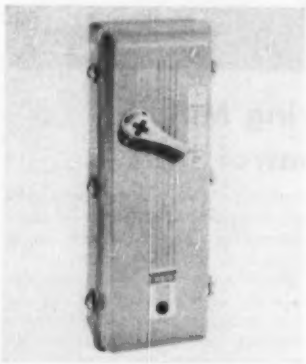
Headstock spindle is carried by two pairs of angular-contact ball bearings, each separately housed in an oil bath. Heavy nose bearings are accurately preloaded to precise float. Lubrication on remainder of headstock is by splash feed in the main chamber. The spindle register for chucks is of conical form, attachments being secured by three quick-release cams.

The transmission is mechanical and gear selection is by a dual-range dial in conjunction with a fast and slow lever. Drive gears are oil immersed, and controlled by a friction clutch of conventional design through a lever mounted close to the headstock nose.

Totally enclosed auto-lock feed gearbox is oil immersed. Threads and feeds are given on a large dial, and changes are rapidly effected by the turn of a knob. The leadscrew is carried by three ball races, two angular contacts for adjustable thrust, and one self-aligning. The conventional chasing dial and nut release are incorporated, and in addition the leadscrew may be disengaged or reversed by a knob-operated, single-dog clutch at the headstock. A range of 82 threads can be cut from 3 to 92 tpi and 0.25 to 4 mm pitch.

DCMT Sales Corp., 164 Duane St., New York 13, N.Y.

(MORE DATA? CIRCLE FYI 35, p. 147)



Starter Combined With Motor Protection and Disconnect

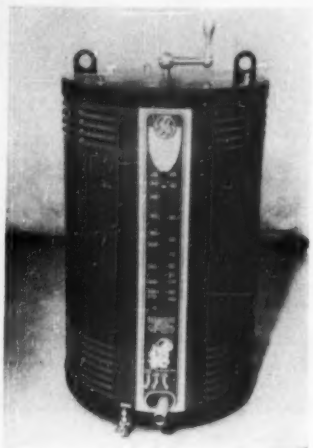
The Life-Linestarter, Class 11-206-N, combines motor starter, motor protection, and disconnect in a redesigned enclosure to save space and increase safety.

The unit is for across-the-line starting of squirrel-cage induction motors, or as a primary switch for wound-rotor motors. With capacities from ¼ to 100 hp, and 110-to 600-volt polyphase, the unit is available in NEMA sizes 0 through 4, and NEMA-type enclosures, 1, 1A, 3, 4, 5, 7, and 9.

The starter provides fast, trouble-free operation due to the simple action of a see-saw pivoted on a knife-edge bearing with a kick-out spring to insure positive opening. Delayed tripping of safe overloads, and instantaneous action on short circuits is claimed for the quick-make, quick-break thermal-magnetic AB De-ion Circuit Breaker. Designed for use with up to three padlocks, the starter handle is interlocked to prevent opening of the enclosure when the breaker is closed.

Westinghouse Electric Corp., P.O. Box 2099, Pittsburgh 30, Pa.

(MORE DATA? CIRCLE FYI 36, p. 147)



GE Portable AC Welder Uses Silicone Insulation

Known as the 6WK30J Series, this welder line is said to be one of the first using silicone insulation. A high margin of safety and operating dependability is claimed for this insulation, since it is unaffected by high temperatures and is water repellent.

Instant arc striking without any manual adjustment is claimed for Hot Start automatic control. The correct amount of boost is furnished for any specific current setting. The ampere range is covered by three overlapping current ranges which permit precise current control. Lower operating costs are claimed because idling current is reduced to a minimum.

The automatic control is composed of a hermetically sealed gas-filled time-delay magnetic switch, and a wound resistor. The control causes a surge of increased current to flow

through the welding leads. This surge is present only during the critical starting period, and its degree is considerably higher at very low currents than at higher current settings. Automatic reduction of boost at higher current settings avoids drawing current surges from the power line.

The welder weighs 325 lb, has a current range from 40 to 375 amps, and accommodates electrodes from 3/32- to ¼-in diameter.

General Electric, Schenectady 5, N.Y.

(MORE DATA? CIRCLE FYI 37, p. 147)

Brown & Sharpe Micrometers Have Carbide Measuring Surfaces

A few of the major improvements put in this micrometer caliper are: carbide measuring faces; large-diameter thimble with wide-spaced divisions for easy reading; one-piece stainless-steel spindle and screw, permanently rustproof; and hardened and ground threads.

Additional features include: a dull chrome finish; black figures and graduations; sliding taper thread adjustment; positive lock-screw and thimble; and longitudinal thimble adjustment.

Brown & Sharpe Mfg. Co., Providence 1, R.I.

(MORE DATA? CIRCLE FYI 38, p. 147)

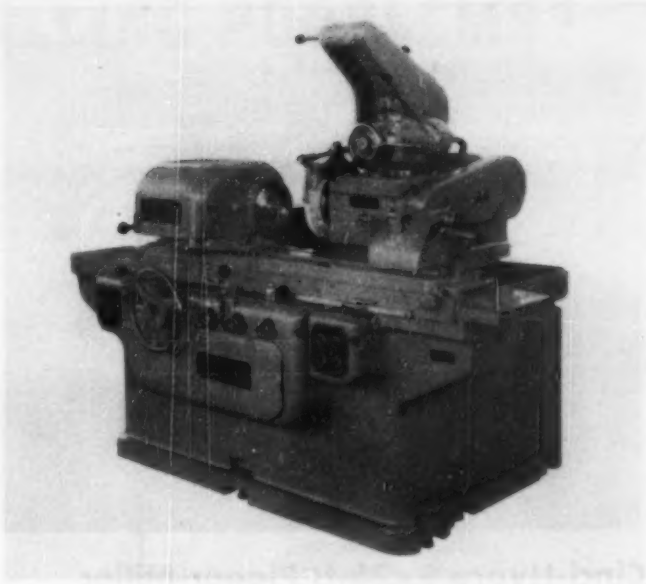
Gulf Cutting Oils Have Light Color, Good Transparency

Other improvements claimed for Lasupar oils include better cutting ability, and anti-rust properties. Free elementary sulphur, sulphurized mineral oil, and sulphurized fatty oils have been put in. The sulphurized fatty oil is said to provide high lubricity and anti-weld properties.

Manufactured in a range of viscosities to permit a choice of the proper grade to suit the particular job. Selection is based on various control factors, such as type of metal being machined, cutting feeds and speeds, type and shape of cutting tools, and chip removal.

Gulf Oil Corporation, 722 Gulf Bldg., Pittsburgh 30, Pa.

(MORE DATA? CIRCLE FYI 39, p. 147)



Hand-Wheel Positioning Eliminated In Landis Universal Grinder

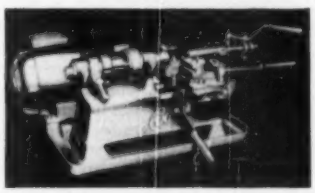
The CH 10x24-in. universal grinder is equipped with a swinging-type internal-grinding fixture which was previously available only on the 12-in. universal. This fixture enables quick changeover from external to internal grinding operations. The housing for the 1-hp motor and internal spindle is hinged to a casting mounted on the wheelbase. The angle is of the tapered-bearing type so that any play that may develop can be easily eliminated.

A removable internal fixture is available for operations requiring additional power. This fixture is driven directly from the wheel-drive motor.

Another feature is a hydraulic wheel-positioning mechanism. Not a grinding feed, it rapidly advances or retracts the wheelbase to the proper position prior to or after grinding. A lever at the front of the machine controls both speed and direction. A safety interlock prevents it from being operated during normal grinding setup.

Landis Tool Co., Waynesboro, Pa.

(MORE DATA? CIRCLE FYI 40, p. 147)



Toolholders on CVA Bench Lathe Are Adjustable for Height

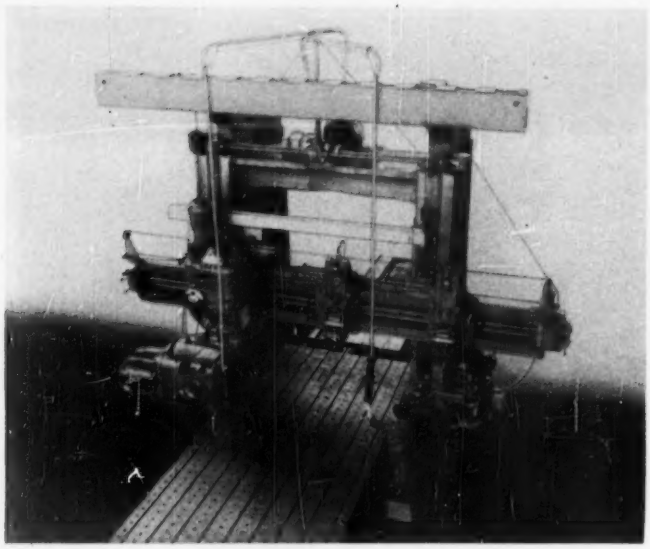
Height of centers	3 15/16 in.
Spindle speeds	1020, 2010 rpm
Max. traverse of cross slide	1 1/8 in.
Max. traverse of front tool slide	2 in.
Max. distance between centers	2 3/4 in.

The collet attachment, tailstock, and compound slide on this bench lathe are lever-operated. The front and rear tool holders are adjustable for height, while angular adjustments up to 22° left and 33° right can be set on the front tool slide. Adjustable dead stops are provided for both the compound slide and tailstock. The flat-belt drive is provided with an adjustable jockey pulley for tensioning.

Complete with ¾-hp motor and switch gear for 220-volts, 3-phase, 60-cycles ac supply, one ½-in.-dia headstock collet and one ¼-in.-dia tailstock collet.

DCMT Sales Corp., 164 Duane St., New York 13, N. Y.

(MORE DATA? CIRCLE FYI 41, p. 147)



Cinci-Hypro 9x26-ft Planer-Miller Carries Five Working Heads

A combination heavy-duty planing machine has three planing heads: one right-hand and one left-hand head on the rail, and a right-hand side head on the column, plus two milling heads: one with a vertical spindle on the rail, and a horizontal spindle on the left-hand column.

Capacity of the machine is work not larger than 26-ft long, 126-in. wide, and 108-in. high. The 75/125-hp planer drive on the left side of the machine powers the table at 6.7 to 200 fpm, variable in infinite increments. The ways are non-metallic, and are force-lubricated. Separate pendant control boxes handle milling and planing operations. The machine also features complete herringbone-gear table drive, dual rail control, and centralized saddle control.

The two rail planer heads may be operated separately or together, and both can be shifted to provide clearance for the milling head. The side planer head has a power cross feed.

Milling is done through 10-in. quills on both heads, powered by 25/50-hp two-speed motors, and with 16 speeds through 8 gear changes. Table feed for milling is with electric controls at 1 to 60 ipm. Both milling-head saddles are electronically fed at 1 to 40 ipm, and the cross rail can be fed up and down electronically at ¼ to 10 ipm.

Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

(MORE DATA? CIRCLE FYI 42, p. 147)

Strong Steel Developed With Good Resistance to Corrosion

This steel is said to remain tough even at temperatures below zero where many structural materials tend to show some loss.

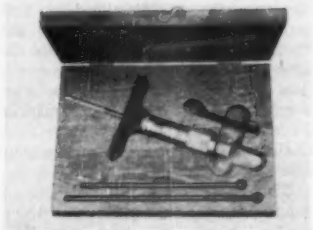
Bearing the grade designation T1, this Carilloy steel, developed by Carnegie-Illinois, will have use in the construction of ships and heavy mobile equipment.

With almost double the strength of the high-strength, low-alloy steels, the T1 will effect savings in mobile equipment, since the steel can be made in quantity in standard open-hearth furnaces. It may be welded easily with electrodes that are now available; yet it is claimed to possess almost triple the strength of ordinary welding-grade structural steels.

Special attention was given to the conservation of costly and strategic alloying materials in the design of T1. The strength is drawn from the small quantities of a comparatively large number of alloying elements that are readily available. Welding has no adverse effect.

United States Steel Corp., New York, N.Y.

(MORE DATA? CIRCLE FYI 43, p. 147)



Starrett Micrometer Depth Gages Provide Locknut to Hold Settings

Line of micrometer depth gages provide the following features: choice of 2½-, 3-, 4-, and 5-in. bases; ranges from 0 to 3 in. or 0 to 6 in.; no glare, rust-resistant "Satin Chrome Finish"; locknut to hold settings; precision-ground screw — 1-in. movement; quick-reading graduations in thousandths of an inch.

The No. 440 with 2½-in. base is designed for use in restricted areas. The No. 445, Series A, B and C, provide a choice of 3-in., 4-in., or 5-in. base where a wider base is preferred or required for spanning wide holes.

L. S. Starrett Co., Athol, Mass.

(MORE DATA? CIRCLE FYI 44, p. 147)

W-F Small-Prong Dies Produce More Uniform Threads

A line of small-prong dies are said to produce more uniform and smoother precision threads than has been possible heretofore.

The dies are made with 36 to 360 threads per inch in diameters from 0.250 to 0.016 in. Tolerances can be held to plus or minus 0.0002 in. on the pitch diameter. All threads are hobbed and lapped to produce sharp cutting edges and smooth threads. Material is either high-speed, carbon, or special-alloy steel to meet job requirements. The dies are used on B & S Automatic, Swiss type, and for hand operation.

Woodruff & Stokes, Quincy 69, Mass.

(MORE DATA? CIRCLE FYI 45, p. 147)

NEW DRILLING PROBLEMS?

LOOK TO LELAND-GIFFORD

For the right method — the right equipment

When new products or new production requirements bring new drilling problems, look to Leland-Gifford for a quick and effective solution. As the leading manufacturer of motor spindle drilling machines, Leland-Gifford offers you expert technical assistance and on-the-spot engineering service plus the knowledge and experience of the country's foremost designers of modern precision drilling equipment. The complete Leland-Gifford line includes drilling machines of every type to take care of all holes from the smallest up to 1¼".

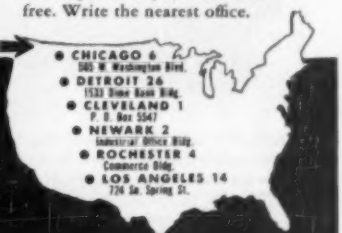
Write for Complete Information

PRODUCTION MEN

Get this handy slide rule

A valuable aid in figuring costs and setting production schedules. Quickly gives time required to drill holes of any size and depth in any material. It's free. Write the nearest office.

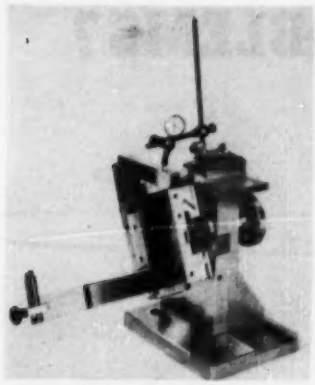
SAVE DAYS — CONTACT THE OFFICE NEAREST YOU



LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



Wheel Dresser Is Capable of Dressing a Complete Form

This universal dresser is capable of dressing a series of angles with all locations held—rather than a single radius and angle tangent. This is made possible through movements in the column and base with gage-block application. The angles may be set with sine bar in addition to graduations. Absolute rigidity is said to be accomplished by preloaded ball-bearing-equipped angle slides and the rotating bearings. The dresser may be used under the wheel or at the side, and all settings may be made without removing from the machine.

When the gooseneck is removed, the dresser may be used as a revolving fixture for the rolling of radius. All setting positions contain a 0.200 step for settings starting from 0.0001 and up. The knob that revolves the radius actuates the slide when locked in angle position.

Universal Form Tool Co., 7410 Rutherford, Detroit 38, Mich.
(MORE DATA? CIRCLE FYI 46, p. 147)

GE Combination Starter Conforms To Automotive JIC Standards

A drip channel across the top and around the sides of the steel enclosure prevents liquids spilled on the case from entering around the door. The door itself has a long-life Neoprene rubber gasket which resists deterioration even if oil accidentally comes in contact with it. Case contains no knockout or mounting holes; outside mounting brackets being furnished.

The prescribed machine-tool-type transformer, with 230/460-115-volt multiple-rated primaries, is included. This heavy-duty transformer has a built-in single-pole circuit breaker to provide short-circuit protection for the control circuit.

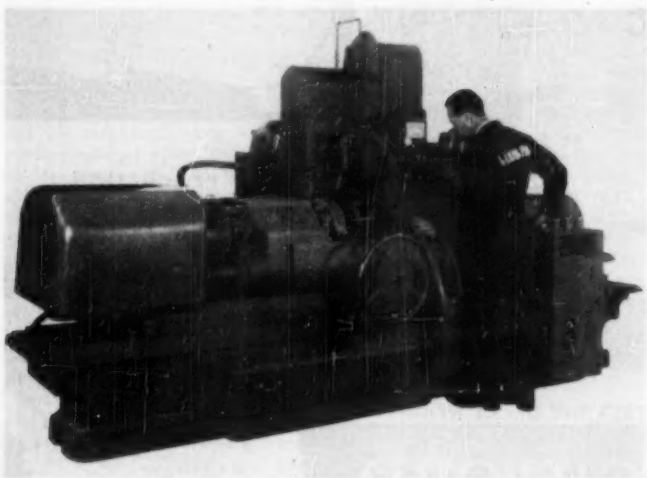
General Electric, Schenectady 5, N.Y.
(MORE DATA? CIRCLE FYI 48, p. 147)

Fluorescent Bulb and Shade Fits Into Small Shop Lamp

Hot incandescent work lights may now be converted to cool fluorescent simply by screwing this "bulb" into an ordinary socket.

The light contains two 4-watt lamps and all control components within the 2x6-in. aluminum shade. Illumination of up to 500 foot-candles is provided at 3- to 5-in. working distance. Size is 1¾-in. high, 2-in. wide, 6½-in. long, and the shade is able to rotate 300°.

Stocker & Yale, Marblehead, Mass.
(MORE DATA? CIRCLE FYI 49, p. 147)



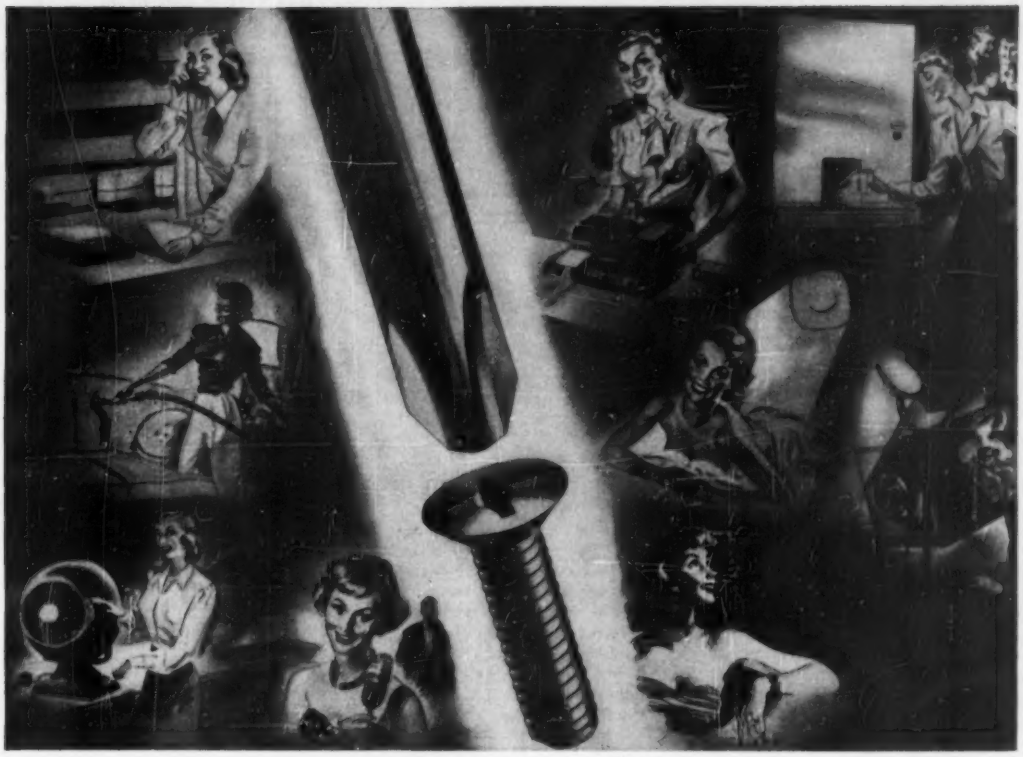
CRANK-PIN GRINDER is available in swings of 16 or 25 in. and in lengths to accommodate 32-, 42-, and 72-in. crankshafts. An improved model, lubrication to the carriage and wheelbase ways is from a separate reservoir with pump and filter. A switch prevents operation of the machine unless pressure exists. —*Landis Tool Co., Waynesboro, Pa.* (MORE DATA? CIRCLE FYI 47, p. 147)

Westinghouse Manual Starter Has Indicating Light

An improved starter, the Motor Sentinel Class 10-023, is equipped with an indicating light which shows when the motor is running. Available as a double-pole switch with ratings up to 1-hp, 250-volts ac or dc.

Quick make or break action is provided by an over-center self-indicating toggle mechanism. Bimetallic overload protection allows safe-capacity overloads but automatically disconnects the motor on any sustained overload. Proper selection of the replaceable heater allows sufficient time delay for small-motor starting.

Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.
(MORE DATA? CIRCLE FYI 50, p. 147)



Top Products in Every Line
Cut Costs and Build Sales
with AMERICAN PHILLIPS SCREWS

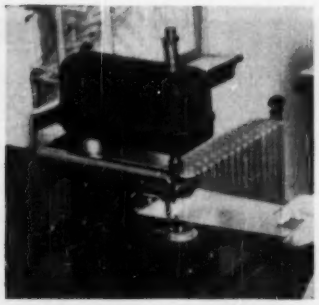
HOW THEY CUT COSTS: From vacuum cleaners to vending machines; from trucks to office appliances and suntan lamps . . . manufacturers use American Phillips Screws to speed up production, stop spoilage, and cut unit-costs. For these modern fastenings banish fumbling, crooked driving and scarred surfaces . . . *cut assembly time as much as 50%.*

HOW THEY BUILD SALES: On any product, the crossed-recess of American Phillips Screws is a "green light" to buyers who stop and look for an outward index of inward quality. They know that smooth-headed American Phillips Screws protect product-performance by staying tight and resisting vibration. Does *your* product have these two American Phillips advantages of cost-reduction and sales-promotion? No reason why it shouldn't . . . *for American Phillips Screws always cost least to use.* Write for proof.

AMERICAN SCREW COMPANY, Main Office: Providence 1, R. I.
Plants at Willimantic, Conn., and Norristown, Pa.
Warehouses at: Chicago 11: 589 E. Illinois St. Detroit 2: 502 Stephenson Bldg.

AMERICAN PHILLIPS Screws

ALL TYPES
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)



Hardness Tester and Certifier For Sheet-Metal Parts

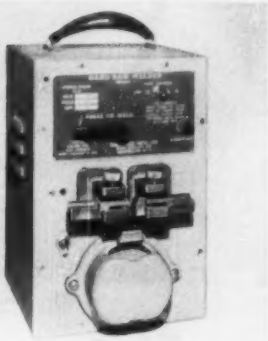
Included in this tester is an adaptation of a Barcol unit that can be set for the desired hardness. By means of a conversion chart, Brinell, Rockwell, or Vickers numbers can be certified.

In operation, an impressor needle moves up and down on an anvil. Pieces to be inspected are fed between needle and anvil, and when the point contacts the part, a dial reading is visible, and a green light flashes if the piece is of the required hardness. A stamp then automatically certifies the piece, and at the same time a counting device registers the total pieces inspected. When a metal part is not of the required hardness, none of the above functions work.

The whole operation is automatic, except for manual feeding of the part.

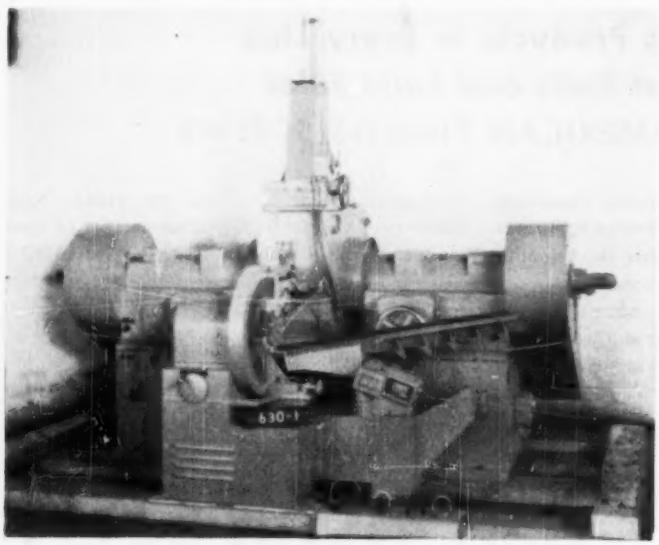
Topflight Tool Co., Inc., 116 E. MarketSt. York, Pa.

(MORE DATA? CIRCLE FYI 54, p. 147)



WELDER for bandsaw blades handles the new 0.050-in.-diameter contour cutting blade, as well as all types of blades up to ½-in. flat. The welder is fully automatic. There are no tension adjustments or knobs to turn, the simplified controls assuring uniform results at all times. A built-in grinder removes flash from the weld.—*Brennen Mfg. Co., 228 Seeley St, Brooklyn, N. Y.*

(MORE DATA? CIRCLE FYI 55, p. 147)



PISTON-RING GRINDER, the No. 630-30-in., requires a minimum of time for changeover between ring sizes. A variable-speed feeder on the front of the machine uses a rotating magnetic disk which picks off rings from an inclined vibrating trough. The two heads have spindles 6.3 in. in diameter. — *Gardner Machine Co., Beloit, Wis.*

(MORE DATA? CIRCLE FYI 56, p. 147)

Gulf Cutting Oils Have High Sulphur Content

Electrode cutting oils made by Gulf have a lighter color to permit closer inspection of machine parts. The oils contain highly active sulphur. They are recommended for heavy-duty machining operations on ferrous metals and alloys, particularly for low-machinability steels. They are claimed to have excellent anti-weld characteristics and high load-carrying ability.

Gulf Oil Corp., 722 Gulf Bldg., Pittsburgh 30, Pa.

(MORE DATA? CIRCLE FYI 57, p. 147)

Cupro-Nickel Alloys Checked for Brazeability

A manufacturer of heat exchangers had its production line shut down periodically due to defective brazing of the joints. The exchangers were being delivered from the furnace with the brazing metal and parent metal unjoined.

Riverside Metal Co. developed the following procedure for testing the alloy before brazing:

During the casting of each heat, a test coupon of the cupro-nickel alloy used is taken. The coupon is taken immediately to the laboratory rolling mill where it is reduced to a thinner gage. These latter test pieces are then put into a combustion tube furnace and held for 15 min at 2050 F, in order to duplicate the time, temperature, and atmospheric conditions of actual brazing.

After the sample is removed from the furnace, its surface is examined visually. If the surface is bright, the heat is acceptable.

Riverside Metal Co., Riverside, N. J.

(MORE DATA? CIRCLE FYI 58, p. 147)

Marking of Stainless Steel Produced by Treating Surface

A process called Ateen-Ate treats blackened stainless steel to produce permanent designs or markings. The blackened areas are part of the surface; no foreign matter is applied. The markings are claimed to have anti-corrosive qualities equal to the stainless.

The company will use Armco stainless in their process. An important application will be to put easy-to-read markings on dials, signs, name plates, and instruments, and as the process will handle up to 132-screen halftones, photographs can be reproduced.

Stainless Ornamentals, Inc., 12 Harcourt St., Boston, Mass.

(MORE DATA? CIRCLE FYI 59, p. 147)

FYI

FOR YOUR INFORMATION

FREE details about new machines & tools
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FYI—these initials symbolize information that's important. We use them, too, to head our expanded reader service. Here are two postcards which will bring you free literature, bulletins on new equipment, materials or methods, further information from any advertiser, or advice from editors—for a 3-cent stamp.

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NEW BULLETINS

TOOLS AND ACCESSORIES

1 OILERS—*Syscо-Dukes Co., Detroit 6, Mich.* 16-page catalog describes oil cups, vents, special tube forms, and oilers. Drawings and dimensions of each type available is included.

2 THICKNESS GAGE—*Westinghouse Electric Corp., Pittsburgh 30, Pa.* 8-page bulletin illustrates and describes an X-ray gage, used in measuring cold-rolled strip. Electrical and mechanical specifications are given.

3 HARDNESS TESTER—*Ames Precision Machine Works, Waltham 54, Mass.* 8-page folder describes portable testers using either Rockwell A, B, or C scales. Another model tests with Rockwell H and T scales.

4 OIL SPRAY—*Farval Corp., Cleveland 4, Ohio.* 4-page bulletin gives the details on the Spray Valve, which dispenses measured amounts of lubricant at regular intervals on open gearing and slide surfaces.

5 GRINDING-WHEEL BOND — *Chicago Wheel & Mfg. Co., Chicago 7, Ill.* 4-page folder outlines advantages and applications of this resinoid bond, claiming a 4 to 10% increase in output.

HEAT-TREATING AND WELDING

6 WELDING DATA—*Eutectic Welding Alloys Corp., New York 13, N. Y.* 48-page manual on welding engineering and design, showing data covering the use of low-temperature welding alloys.

7 TORCHES—*Air Reduction Co., Inc., New York 17, N. Y.* 36-page catalog contains information on the use of hand torches for welding and cutting, outfits, tips, and accessories. Charts show correlation of each component part for another.

8 DEPTH HARDENING—*Wilson Carbon Co., Inc., New York 17, N. Y.*

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27 28 29 30 31 32 33 34 35 36 37 38 39
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66 67 68 69 70 71 72 73 74 75 76 77 78
79 80 81 82 83 84 85 86 87 88 89 90 91
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FYI

FREE details about new machines & tools
FREE data on new materials or parts
FREE shop calculators and data sheets
FREE information from advertisers
FREE advice on metalworking problems

Bulletin No. 19 shows how any kind of steel can be gradient depth hardened with a positive change in grain structure by use of the company's compounds.

9 INVERT ARC WELDING — *Mahd & Harnest Corp., New York 17, N. Y.* 6-page bulletin covers the inert-gas-shielded tungsten process using helium or argon. It gives operating hints and specifications.

10 ATMOSPHERE FURNACES — *Surface Combustion Corp., Toledo 1, Ohio.* 4-page bulletin shows 5 different furnaces, and describes their applications. The compositions of the atmospheres used and the generators in which they are produced are also described.

11 PYROMETERS — *Wheelco Instruments Co., Chicago 7, Ill.* 8-page catalog shows a selection of typical indicators, controllers, and annunciation safeguards. Includes a 4-page price list.

PLANT-SERVICE EQUIPMENT

12 VIBRATING SCREENS — *Link-Belt Co., Chicago 1, Ill.* 12-page booklet 2264 describes concentric-action screens for medium- and heavy-duty service, doing sizing, rinsing, and dewatering of a wide range of materials. Installed dimensions, weights, and other engineering layout data are given.

13 MILL CRANES — *Harnischfeger Corp., Crane Div., Milwaukee, Wis.* 19-page booklet illustrates and describes features of P&H cranes. Photos show typical installations.

14 HAND TRUCKS—*Clark Equipment Co., Industrial Truck Div., Battle Creek, Mich.* 12-page booklet describes two new powered hand trucks: the Electrolift, battery powered; and the Hydrolift, gas powered.

15 FIRE EXTINGUISHERS—*C-O-Two Fire Equipment Co., Newark 1, N. J.* 4-page bulletin pertains to two new dry-chemical extinguishers. Gives construction details and lists other bulletins for further enlightenment.

PARTS AND MATERIALS

17 LOCKNUTS—*Lockwasher Section, Industrial Fasteners Institute, Cleveland, Ohio.* 16-page booklet gives a history of locknuts on 5 pages and then describes and gives the principle of operation of 23 of the sort.

18 HYDRAULIC OILS—*Sun Oil Co., Philadelphia 3, Pa.* 12-page booklet entitled "Select Right for Your Hydraulic System" gives hints on oil maintenance, instructions for cleaning systems, tips on filtering, and draining.

19 UNIVERSAL JOINTS—*Curtis Universal Joint Co., Inc., Springfield 7, Mass.* Catalog 51 describes the company's products, data how to select universal joints, and gives engineering data and specifications.

20 FLEXIBLE SHAFTS — *The S. S. White Industrial Div., New York 18, N. Y.* 16-page bulletin 5008 outlines the basic principles of flexible-shaft selection and application. Describes the company's products.

21 TRANSMISSIONS—*Reeves Pulley Co., Columbus, Ind.* 12-page bulletin describes variable-speed transmissions, motor drives, and cones pulleys. Engineering data and specifications are included.

22 PLASTICS — *The Richardson Co., Melrose Park, Ill.* 8-page brochure describes laminated and molded plastics products, and outlines the company's production facilities and plastics-engineering services.

23 CUTOUT COUPLINGS — *Anchor Steel and Conveyor Co., Dearborn, Mich.* 12-page catalog introduces a line of couplings that offer motor control when overload occurs, plus the features of a flexible coupling.

24 TRANSMISSION BELTING—*Thermoid Co., Trenton, N. J.* 8-page bulletin on flat transmission belting contains complete formulas, charts, and tables for their proper selection.

25 TUBING — *Tube Reducing Corp., Wallington, N. J.* 8-page folder RA describes the compression-forming process, tolerances, surface finish, heat-treatment, mechanical properties, types, shapes, and sizes.

MISCELLANEOUS

26 ADHESIVES — *Minnesota Mining and Mfg. Co., St. Paul, Minn.* 16-page catalog tabulates the properties of over 100 industrial adhesives, sealants, and sealers.

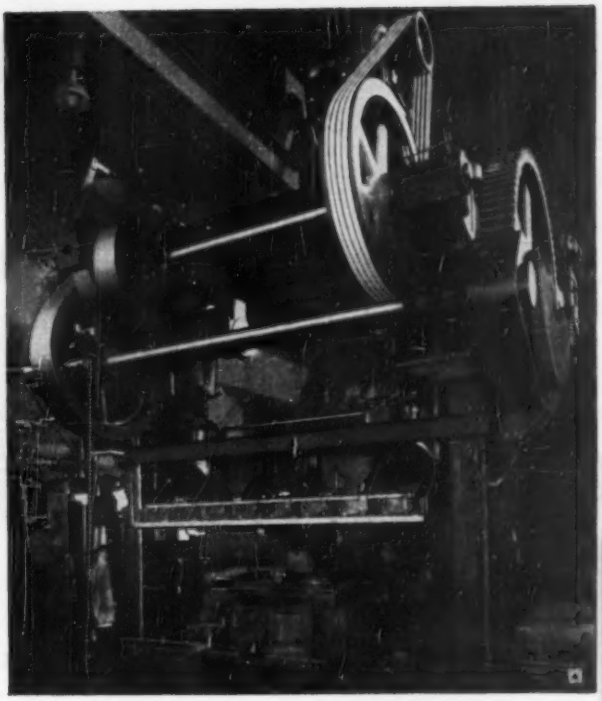
27 MACHINING PLASTICS—*Synthane Corp., Oaks, Pa.* 6-page folder of data, instructions on "Practical Methods of Machining Synthane Laminated Plastics" includes such data as tool speeds and recommended machine setups.

28 AIR CONDITIONING — *Frigidaire Div., General Motors Corp., Dayton 1, Ohio.* 16-page folder "Facts About Frigidaire Refrigeration and Air Conditioning for Industrial Use" tells about the units and shows their applications.

29 ELEVATORS — *Westinghouse Electric Corp., Pittsburgh 30, Pa.* 36-page booklet to serve as a reference on elevators. Contains information on different types of elevator controls, selection, budget, pricing data, and how to install, safety features, and modernization.

Gates

The Mark of SPECIALIZED Research



The output of this press was seriously bottlenecked by slipping of the short center flat belt with which it was formerly equipped. The Gates Vulco Rope Drive shown has completely overcome the difficulty. The original belts, after more than 4½ years of service, are still going strong.

Let this simple test tell you exactly WHY the Concave Side cuts your V-Belt costs

To see for yourself the belt-saving importance of the Concave Side, just pick up *any* V-belt and bend it as it bends when it goes around a pulley.

As the belt bends, grip its *sides* firmly with your fingers. You will feel the sides of the belt *change shape.* This is because the top of the belt is under tension and, hence, grows *narrower* while the body, under compression, *bulges out.* (See figure 1 and 1-A)

Now look at figures 2 and 2-A. There you see how the bending changes the shape of the belt that is built with the Concave Side —The Gates Vulco Rope. The concave sides of this belt merely *fill out* and become perfectly *straight.* There is no side-bulge. This belt, when bent, *precisely fits its sheave groove.*

A very distinct saving in belt wear results. No side-bulge means that the sides press *evenly* against the V pulley and therefore wear *uniformly*—resulting in longer life for the sidewall and, naturally, *longer life for the belt!*

If you care about cutting your belt costs, it will pay you to make sure, whenever you buy V-Belts, that you get the V-Belt with the Concave Sides...the Gates Vulco Rope!

What Happens When a V-Belt Bends

Straight-Sided V-Belt

How Straight-Sided V-Belt Bulges in Sheave-Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear at Point Shown by Arrows.

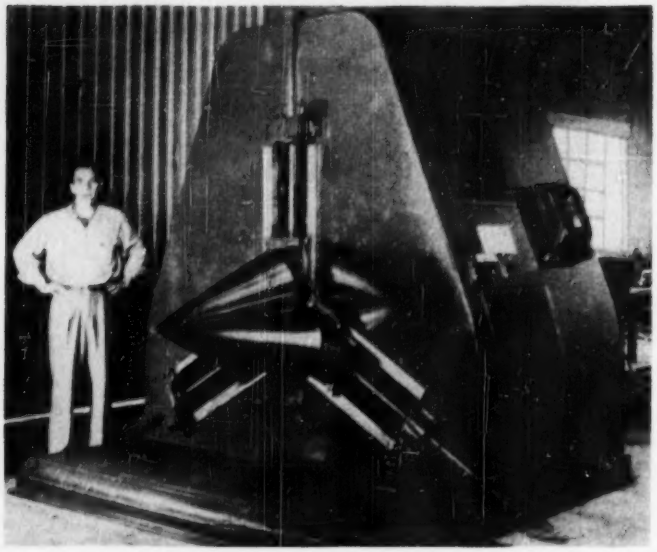
Gates Vulco Rope with Concave Side

The Concave Side Fills Out to a Precise Fit in the Sheave Groove. No Side Bulge! Sides Press Evenly Against the V-Pulley—Uniform Wear—Longer Life!

CS-508

THE GATES RUBBER COMPANY
DENVER, U.S.A.
World's Largest Makers of V-Belts

GATES VULCO ROPE DRIVES
Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS Foreign Countries



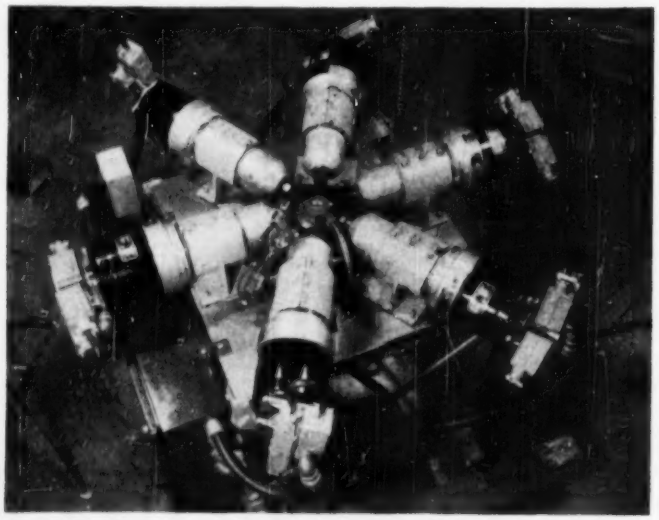
Reed Cone-Rolling Machine Uses Independently Driven Rollers

The Model R employs three conical-shaped rolls mounted in a cantilever design. It is claimed conical shapes can be produced with almost a complete point on the small end. Each roll can be adjusted independently by separate motors.

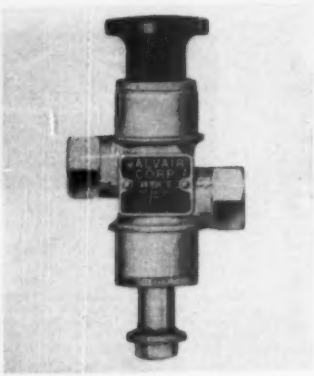
Due to universal adjusting feature, the rolls can be set for any position from full parallel up to a 45° included angle. The forming rolls are interchangeable. The changing is made from the front of the machine.

Reed Engineering Co., 1003-17 W. Fairview Ave., Carthage, Miss.

(MORE DATA? CIRCLE FYI 60, p. 147)



DRILLING MACHINE simultaneously drills six holes in Army-Navy Aeronautical-Standard hex-head bolts. The bolt is loaded manually and held by an air clamp. All movements of the machine are electrically interlocked.—*Simplex Tool Engineering Co., 2540 Park Ave., Detroit 1.* (MORE DATA? CIRCLE FYI 61, p. 147)



Air Control Valve Has Die-Cast Body

The body used is shock-resisting, high-tensile zinc alloy. The models available are knob-operated, two-way and three-way. They are for air, water, or oil service, withstanding pressures up to 175 psi and temperatures up to 125 F. Available in two pipe sizes: ¼ and ⅜ in.

Valvair Corp., 454 Morgan Ave., Akron 11, Ohio.

(MORE DATA? CIRCLE FYI 62, p. 147)

Floor-surfacing material, known as Superset Plastic Rock, is claimed to provide a tougher, more durable floor for surfaces of all kinds. It is said to be more rapid in hardening than previous products of the company. Delivered in a form containing all ingredients except water. Available in several gradings.

United Laboratories, Inc., 16801 Euclid Ave., Cleveland 12, Ohio.

(MORE DATA? CIRCLE FYI 63, p. 147)

Scoop accessory for lift trucks picks up and transports bulk materials. Actuated by a two-way hydraulic cylinder, the scoop will tip 45° forward for dumping, and 30° backward for carrying. Detachable couplings in the hydraulic lines make the accessory readily interchangeable with standard pallet forks.

Towmotor Corp., Cleveland, Ohio.

(MORE DATA? CIRCLE FYI 64, p. 147)

Hand cleaner removes grease, tar, paint, or printers' ink without harsh solvents or grits that irritate the skin. In cream form, it requires no water for either application or removal. Dispenser works by pressure on a plunger to provide the quantity of substance needed.

Kalene Corporation, Dept. AM, Minneapolis, Minn.

(MORE DATA? CIRCLE FYI 65, p. 147)

for

- **increased production**
- **greater versatility**
- **wider range of work**
- **LOWER COSTS**

Here's an all-hydraulic controlled tracer with a DUAL PURPOSE . . . for tracing from round or flat template and regular lathe work with unlimited range for both. Note how simple: just position one lever on clutch and brake unit to engage or disengage the tracer . . . that's all. No loss of time, no extra space, no parts to bother with, no extra expense for a single-purpose tool.

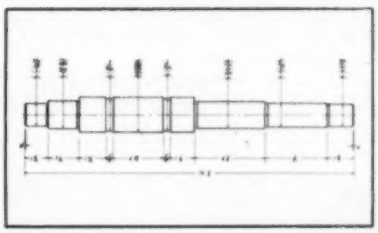
ABSOLUTELY SAME PRECISION ACCURACY AS WITH ALL SIDNEY PRODUCTS. Changes in contour of the master piece are transmitted through the ultra-sensitive tracer valve as magically as if by an "electric eye" . . . even sharp shoulders are faced to amazingly close limits.

ADD the Sidney Fluid Tracer to any Sidney Model 32 Lathe. You'll enjoy the savings and efficiency of

THE FINEST TURNING TOOL EVER PRODUCED

Please write for detailed literature or contact your nearest Sidney representative.

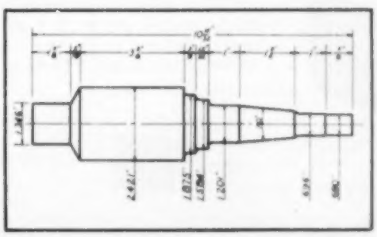
AMAZING SAVINGS THROUGH SIDNEY TURNING TIME



Normal Turning Time
4 hrs. 33 min.

SIDNEY TURNING TIME
38 min.

YOU SAVE
3 hrs. 55 min.



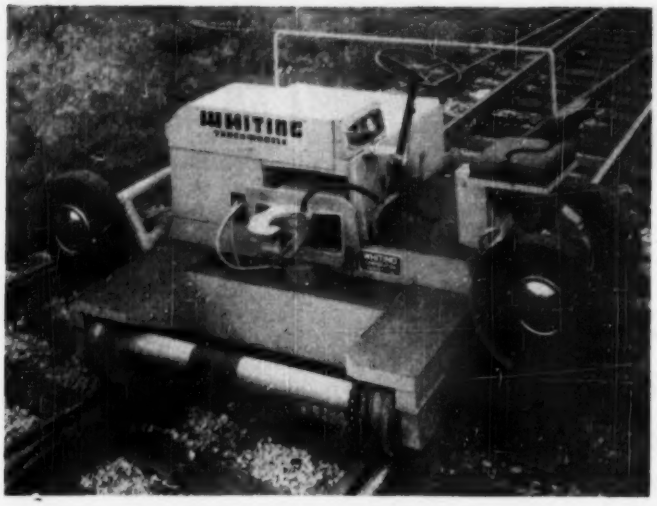
Normal Turning Time
25 min.

SIDNEY TURNING TIME
2 min. 31 sec.

YOU SAVE
22 min. 29 sec.

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

BUILDERS OF PRECISION MACHINERY SINCE 1904



Whiting Shop Locomotive Travels on Land or Track

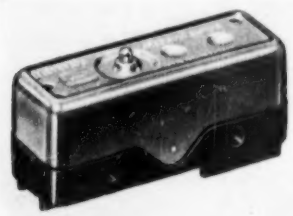
The gasoline-powered Trackmobile makes use of hydraulic jacks in two features that speed the handling of railroad cars.

One feature enables the unit to develop a draw-bar pull of 7350 lb in low gear. After coupling to a railroad car, a hydraulic jack raises the coupler, transferring part of the car's weight to the Trackmobile. This forces it down on the track, increases the static friction — increases the max. draw-bar pull that can be applied.

The unit uses 4 standard AAR steel wheels for track travel. The 4 rubber-tired wheels for ground travel are hydraulically retracted when the unit is used for track operations. Maximum ground speed is 25 miles per hour; track speed varies with load.

Engine used is an L-type, 4-cycle, 4-cylinder 3⅛ x 4⅜ in., 134 cu-in. displacement, max. BHP 60 at 4000 rpm, max. torque 106 lb-ft at 2000 rpm. Conventional hydraulic system is used.

Whiting Corp., Harvey, Ill.
(MORE DATA? CIRCLE FYI 66, p. 147)

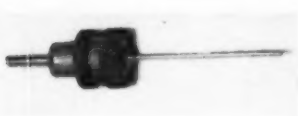


Small Force Needed to Operate Precision Switch

A low operating force with a large movement differential is provided by this snap-acting precision switch. Known as the Type MB, the position of the actuating pin has been relocated to obtain an increased mechanical advantage.

They are available with electrical ratings as follows: 15-amps, 125-volts; 5 amps, 250-volts, ¾-hp at 125/250/460 volts ac non-inductive.

Unimax Switch Div., The W. L. Maxson Corp., 460 W. 34th St., New York 1, N.Y.
(MORE DATA? CIRCLE FYI 67, p. 147)



Deburring Tools Put Out in Smaller Sizes

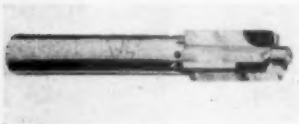
DS series tools have a smaller pilot size for deburring holes as small as ⅛ in. Other sizes are 5/32, 3/16, and 0.189 in.

A free-wheeling knurled sleeve is actuated by the operator while the spindle continues to rotate—it projects the cutting blade to working position and retracts it within the diameter of the pilot shaft. This enables the cutter head to be brought into otherwise inaccessible areas of multi-walled parts.

The cutter blade is rigidly supported by the pilot shaft, providing the necessary support against blade deflection. In addition, in its projected position the blade is firmly locked in place by engagement of a pin within a slot in the body of the shaft, affording further rigidity.

The Series DS operates in any drill-press or power spindle.

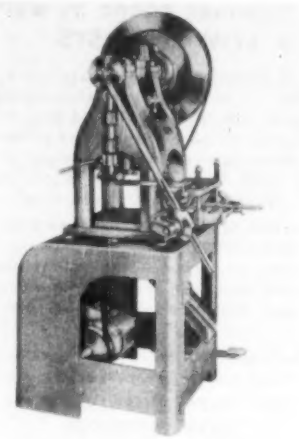
Nobur Mfg. Co., Burbank, Calif.
(MORE DATA? CIRCLE FYI 68, p. 147)



Wendt-Sonis Counterbore Said to Eliminate Chatter

These carbide-tipped counterbores are claimed to eliminate chatter, and provide an extra-smooth finish. The flute design is said to give maximum support for the tool.

Wendt-Sonis Co., Hannibal, Mo.
(MORE DATA? CIRCLE FYI 69, p. 147)



AUTOMATIC PRESS, with an 8-ton rating, has been added to the Hi-Speed line. 5- and 12-ton were the previous models. Features a cylinder-type ram which slides in an adjustable bronze sleeve for greater accuracy and longer life.— *Di Machine Corp., 2711 W. Irving Park Rd., Chicago 18, Ill.*
(MORE DATA? CIRCLE FYI 70, p. 147)

Hjalmar Ellstrom

INVENTOR OF THE GAGE BLOCK

The achievement of perfection . . . the complete mastery of any art or craft or science . . . is a rare human accomplishment. A discovery or an invention that contributes to the progress and total welfare of all mankind is rarely the heritage left by a single man. So rare is it, indeed, that in such infrequent instances, the true facts surrounding its origin are often distorted, obscured, or even lost in the conflicting claims of others who would seek the personal worldly gains to be derived from undeserved fame.

So it was with the Gage Block. For, actually, this basic standard of measurement now used the world around was originally conceived, developed, and invented solely and entirely by . . . Hjalmar Ellstrom.

Here, briefly, is the story of his accomplishment: During the early 1890's, Hjalmar Ellstrom was employed by the government rifle factory at Fskilstuna, Sweden. He was a master craftsman . . . a man of infinite patience who took great pride in his work. He was a man of vision, too, who recognized the limitations imposed upon industry by the lack of sufficiently accurate measuring devices. So, with a then unheard of standard of precision as his ultimate goal, he alone developed and perfected his checking instruments and techniques . . . then alone he created the world's first gage block accurate to the infinitesimal millionth part of an inch.

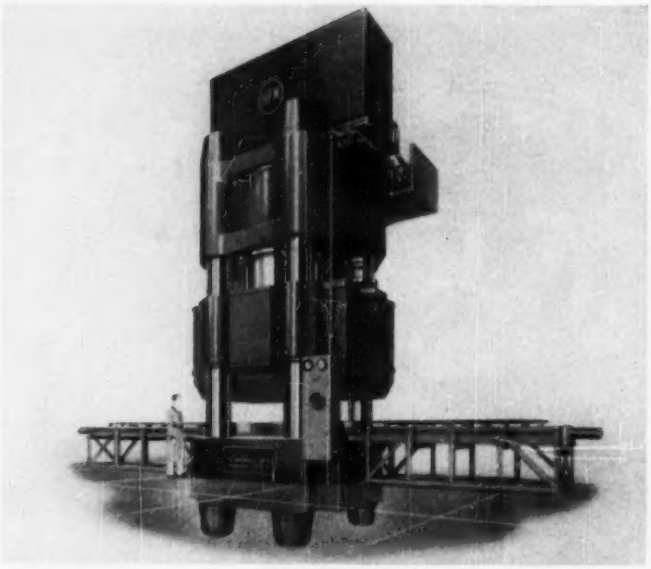
Today, though his achievement has been copied and imitated by others, his personal unqualified devotion to accuracy is the exclusive heritage of Ellstrom.

ELLSTROM . . . *measuring in millionths for three generations*

DEARBORN GAGE COMPANY

22035 BEECH STREET • DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks



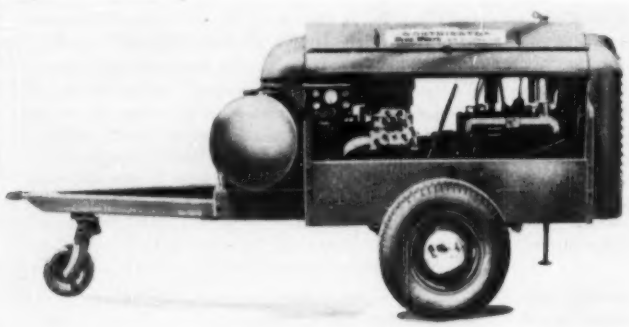
Press For Rubber-Pad Forming Uses Automatic Loading Tables

This 7000-ton press utilizes the Guerin process, developed by the aircraft industry to eliminate its blanking and forming problems. In this process, a rubber pad acts as a pressing medium, forcing the metal against the die blocks. The advantage of this process is said to be that many different parts can be made simultaneously. The rubber pad used in this press is 48 x 120 in.

Hydraulically actuated loading tables enable new die blocks and sheet metal to be fed into the press in a continuous operation.

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio

(MORE DATA? CIRCLE FYI 71, p. 147)



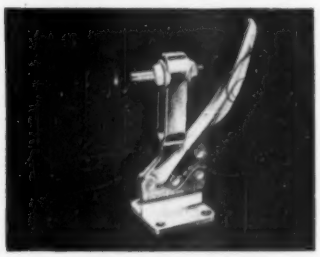
Portable Air Compressor Is Lighter and More Maneuverable

An improved 105-ft portable air compressor has been built by Worthington. It is built around the standard Blue Brute compressor and is powered by either diesel or gasoline engine.

New features and advantages claimed include: a zero-pressure retractable third wheel; underslung spring-mounted undercarriage with heavy-duty 15-in. trailer tires; a simple retractable support leg; a core radiator with pressure cap to prevent boiling; a carburetor with fixed jets; and full-length tool boxes.

Construction Equipment Div., Worthington Pump and Machinery Corp., Holyoke, Mass.

(MORE DATA? CIRCLE FYI 72, p. 147)



Quick-Acting Toggle Clamp Has Holding Pressures to 650 Lb

Known as De-Sta-Co No. 235-U, the clamp features holding pressures up to 650 lb with smooth, fast toggle action. For work-holding fixtures, it has a clamping bar which moves into a fully retracted vertical position when the clamp is opened, allowing maximum clearance for insertion of work. The handle has full hand clearance for safe operation, and a rubber-tipped bolt assembly adjustable both horizontally and to work height.

Bearing holes are reamed, pivot pins are of stainless steel. Dimensions: closed, 2¾-in. high x 10¼-in. long; open height, 6¼ in.

Detroit Stamping Co., 543 Midland Ave., Detroit 3, Mich.

(MORE DATA? CIRCLE FYI 73, p. 147)

Steel tape rewinds itself automatically; it takes but ten seconds for the full 50 ft. Pressure on the centerplate button starts the rewind; release of this pressure stops the action instantly. The tape may be replaced after its markings are worn. Weight is 23 ounces; case diameter 5 in.

Master Rule Mfg. Co., Inc., Middletown, N.Y.

(MORE DATA? CIRCLE FYI 74, p. 147)

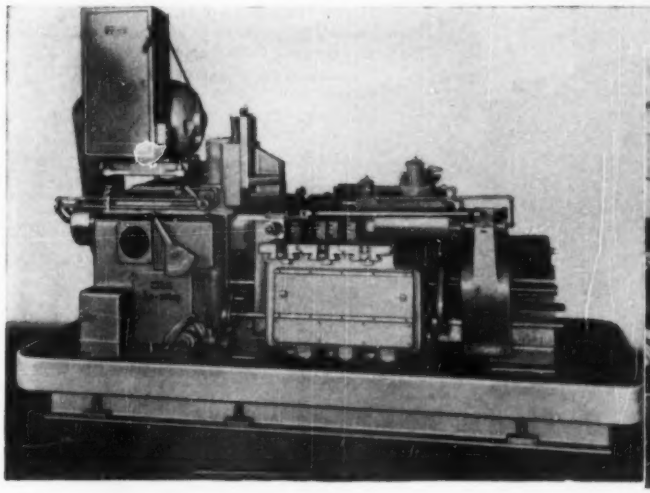
Oscillograph-record camera provides a finished print in one minute. No dark-room facilities are required. By means of a sliding mount, the camera may be positioned so that several traces can be recorded on a single print. It can be used with any standard, 5-in., cathode-ray oscillograph. Shutter settings are 1/100, 1/50, 1/25, time, and bulb.

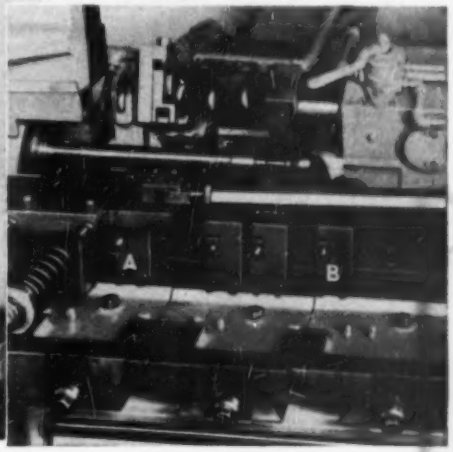
Allen B. Du Mont Laboratories, Inc., Clifton, N.J.

(MORE DATA? CIRCLE FYI 75, p. 147)

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK





MODEL "AR" Lo-swing SLASHES COSTS ON MAIN DRIVE SHAFT

Problem: To offset high labor costs by increased production on Main Drive Shaft.

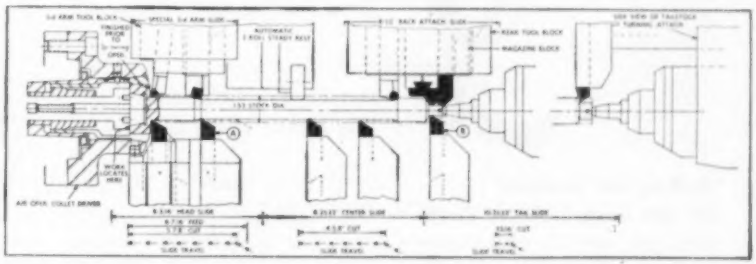
Solution: The Model "AR" Automatic Lo-swing Lathe was selected for this job because it had sufficient weight and rigidity to insure long tool life at high cutting speeds with sintered carbide tools.

Shafts are delivered to the Lathe with the gear end finished to size and the small end centered. The line drawing shows a cross section of the collet chuck which centers and drives the shaft on the gear end. This method of driving increased the rigidity of the shaft. The three-roll steady rest is automatically operated, the rolls being advanced to contact the shaft as soon as tool "A" turns a spotting wide enough to clear the rolls. Tool "A" is the only tool cutting until the steady rest rolls support the piece, after which all the other tools start cutting simultaneously.

Another feature on this machine is the Automatic Tailstock Turning Attachment, shown in the close-up illustration, which is used to rough turn the small end of the shaft ahead of tool "B" which finish turns. This small diameter is held within close limits by this method and a green grind operation is eliminated.

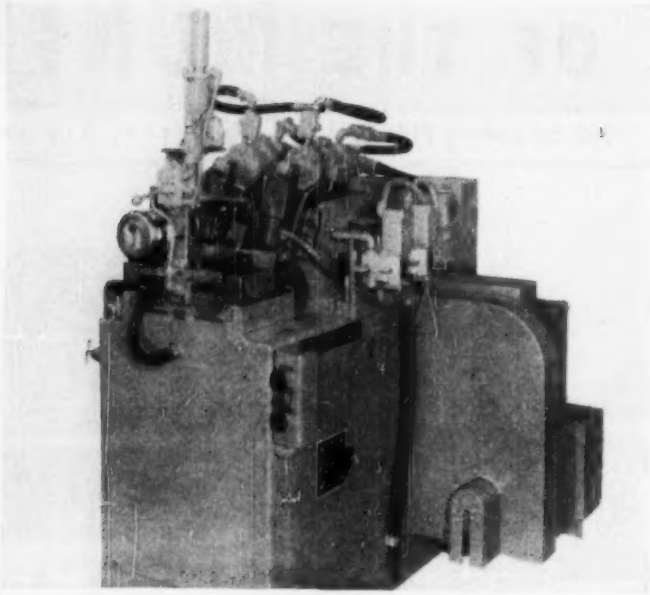
The complete cycle is automatic; the operator simply loads and unloads the parts and pushes the starting button. All tools are carbide. Material is SAE 5140 steel forging and the machine cycle time is 30 seconds.

If you want lower production costs, let us help you with your turning problems.



SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing



Spotwelder Does Work Indexing And Spacing Automatically

This welder is designed to spotweld spouts to stainless steel coffee pots. However, with minor gear and cam alterations, it is adaptable to welding many other products. These changes could permit spot spacing and electrode positioning on the outline of any curved surface within the maximum movement limitations of the equipment.

The welder is equipped with one transformer for two welds. Spot spacing, work indexing, and electrode operation are automatically controlled. Electrodes are always perpendicular to the surface being welded.

The two pouring spouts are welded to two pots during one operation. Two water-tight seams of 66 spots each are made around the spouts in 20 sec. One operator and 3 welders do 770 spouts per hour.

Taylor Winfield Corp., 1050 Mahoning Ave., Warren, Ohio.

(MORE DATA? CIRCLE FYI 76, p. 147)

Bucking Bar Eliminated By Gun Using Explosive Rivets

Rivet gun uses Du Pont explosive rivets for high-speed operation. Only 2 sec are required for setting a rivet. The tips are made of nichrome steel welded to a bronze base. The handle is made of two-piece molded Phenolic on which is located an off-on switch.

Ripley Co., Inc., Middletown, Conn.

(MORE DATA? CIRCLE FYI 77, p. 147)

Portable Fire Extinguisher Uses Blanket of Dry Chemical

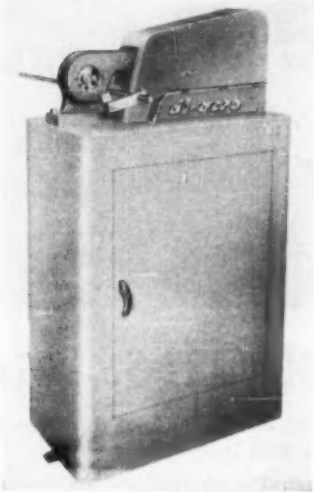
Portable dry-chemical engine is used for extinguishing flammable-liquid and electrical fires.

The great density of the discharge cools and insulates the operator from the heat of the fire. Aided by a discharge range of from 20 to 25 ft, this cooling effect enables the operator to move up quickly on the fire and blast it out with the full force of the discharge.

Added to the force of the discharge is the normal gravity pull of the dry chemical which is heavier than air. Its naturally downward direction, accelerated by the pressurized charge behind it, is said to resist the updraft of the air currents caused by the flames. The expellent is dry nitrogen, with a sustained operating pressure of 200 psi during the period of discharge.

American-La France-Foamite Corp., Elmira, N.Y.

(MORE DATA? CIRCLE FYI 78, p. 147)



Di-Acro Cutoff Machine Equipped With Power Drive

The Power Parter has been designed to accurately cutoff rods and bars without distorting their roundness or crushing the material. Production rate is as rapid as the operator can advance the bar and engage the pedal.

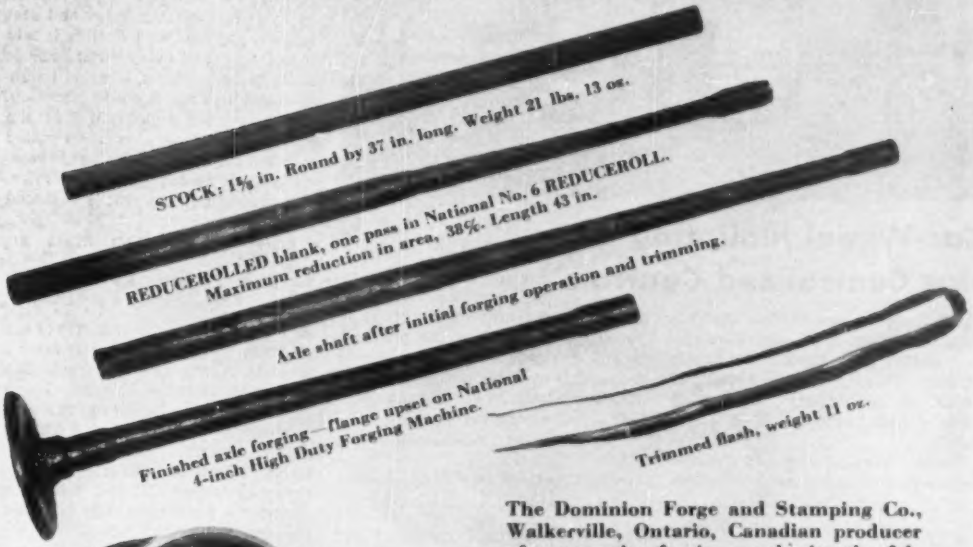
Power is supplied by an air cylinder that is cushioned at both ends for quiet operation. Ten holes are provided in the cutting head for rods ranging from 1/16- to 5/8-in. diameter in steps of 1/16 in. Special size round holes can be supplied. The Ejectomatic gage supplied with the machine allows the separate operations of gaging, parting, and ejecting to be obtained in a single working cycle. All air equipment is housed in a welded steel cabinet with moving parts properly guarded.

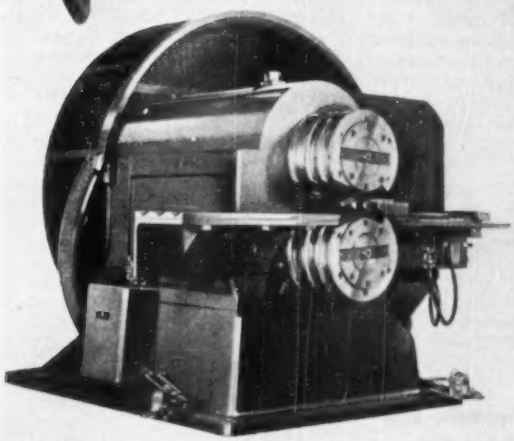
O'Neil-Irwin Mfg. Co., Lake City, Minn.

(MORE DATA? CIRCLE FYI 79, p. 147)

200,000 AXLES REDUCEROLLED

ON ORIGINAL ROLL DIES!


STOCK: 1⅝ in. Round by 37 in. long. Weight 21 lbs. 13 oz.
REDUCEROLLED blank, one pass in National No. 6 REDUCEROLL. Maximum reduction in area, 38%. Length 43 in.
Axle shaft after initial forging operation and trimming.
Finished axle forging—flange upset on National 4-inch High Duty Forging Machine.
Trimmed flash, weight 11 oz.



National No. 10 REDUCEROLL.
Also built in Nos. 1, 2, 4, 6, and 7½ sizes.

The Dominion Forge and Stamping Co., Walkerville, Ontario, Canadian producer of automotive forgings, submits the following production record on axle forgings:

1. **More than 200,000 axle shaft blanks pre-formed on a National No. 6 REDUCEROLL using original non-heat-treated roll dies. Rolls still available as spares after minor repair!**
2. **More than 50,000 consecutive REDUCEROLLED axle forgings accepted without a failure!**
3. **Reduced scrap loss, producing clean, uniform blanks, by REDUCEROLLING.**
4. **Independent laboratory tests prove that REDUCEROLLING *improves* physical characteristics of forgings.**

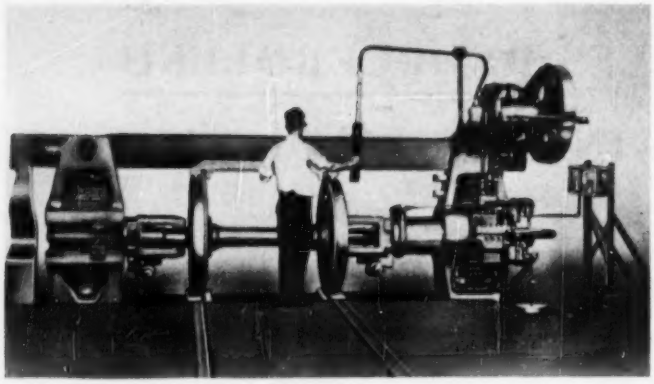
This case history illustrates how REDUCEROLLING simplifies and expedites the production of *superior* forgings!

Let us help you investigate the application of REDUCEROLLING to your forging work. Send us a print or sample of the part you wish to forge—better yet, visit us. No obligation, of course.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET, AND WIRE NAIL MACHINERY

Hartford Detroit Chicago



Car-Wheel Mounting Press Has Centralized Controls

Press features push-button controls by means of which all operations can be handled by a single operator. A pendant is used, suspended from an adjustable swing arm, permitting wide latitude in the operator's movements.

These electrical controls provide for operations of the press ram, control the positioning of the stops in the yokes, and operate the pneumatic kick-out cylinder in the resistance beam. This cylinder pushes the completed assembly free of the yoke providing rapid removal.

Chambersburg Engineering Co., Chambersburg, Pa.

(MORE DATA? CIRCLE FYI 80, p. 147)

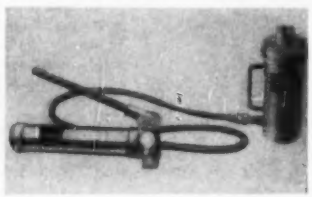
Geneva Dial Indicator Uses Lever-Arm Movement

These instruments are said to be accurate because of the simplicity of the Geneva movement, a lever arm being used instead of a multiplicity of gears. Because the movement has fewer moving parts, lower cost is reported possible with less chance for trouble and repairs. It gives readings within a tenth (0.0001 in.).

Other features include: an internal lock for fine settings; metal dial with clear reading graduations; case and plunger housing machined as one piece from solid brass casting; and a hardened and ground plunger.

Chicago Dial Indicator Co., Department D, 180 N. Wacker Drive, Chicago 6, Ill.

(MORE DATA? CIRCLE FYI 81, p. 147)



Remote-Control Hydraulic Ram Operates in Limited Space

Remotrol rams and pumps enable the operator to lift, pull, or push from a distance and in any direction —up, down, sideways, or at an angle. A "center hole" tubular ram is used on units of 30-ton and greater capacity. It enables use of the ram as a puller. A rod or bolt is inserted through the ram and secured over the head. This construction also simplifies rigging requirements on many jobs.

The rams will be available in 7 models, ranging from 10- to 100-ton capacities. The pumps operate at a maximum of 10,000 psi, with overload safety protection.

Templeton, Kenly and Co., Chicago, Ill.

(MORE DATA? CIRCLE FYI 82, p. 147)

Reducing valve handles working pressures as high as 6000 psi. Known as Type E, the main valve and seat ring are stellite faced. Stellite is said to outwear steel many times because of its great hardness, unusual toughness, and high resistance to corrosion. Other internal metal parts of the valve are made of chromium plated stainless steel. The packings are especially made for high-pressure service, and pressure on the seat is balanced by a piston above.

Atlas Valve Co., 282 South St., Newark 5, N.J.

(MORE DATA? CIRCLE FYI 83, p. 147)

Switch automatically connects or disconnects an electrical circuit after a pre-determined time interval. Settings are made on a large, clearly calibrated dial. Releasing the dial knob starts the time interval and the pointer is driven back toward zero by a Telechron self-starting synchronous motor. During this time period, the knob constantly indicates the remaining time left.

Automatic Temperature Control Co., Inc., 5212 Pulaski Ave., Philadelphia 44, Pa.

(MORE DATA? CIRCLE FYI 84, p. 147)

Respirator, No. 2099, protects against dust, fumes, vapors, mists, smokes, and gases. No filters or cartridges are needed because a continuous flow of fresh air is directed through a hose. Includes 2½-ft., flexible, non-kinking, rubber breathing tube, plus a 12½- to 50-ft. length of 5/16-in.-diameter air hose. Air flow is regulated by an adjustable valve clipped to the worker's belt or clothing.

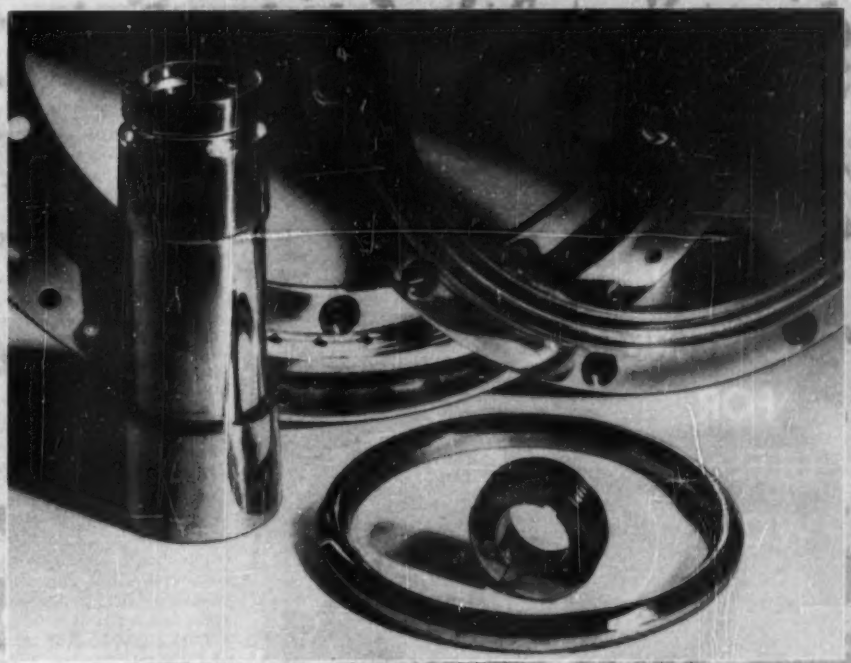
American Optical Co., Southbridge, Mass.

(MORE DATA? CIRCLE FYI 85, p. 147)

Spring coilers, hand operated, make compression, extension, and torsion springs. It is said to be especially useful for making experimental or sample springs and for small production runs up to 500. The setup time is less than five minutes and about 300 springs can be wound per hour. Springs can be made with outside diameters up to ⅞ in., with overall lengths up to 4 in. using wire diameters from 0.005 in. to 0.065 in.

The Carlson Co., 277 Broadway, New York 7, N.Y.

(MORE DATA? CIRCLE FYI 86, p. 147)



Regardless of alloy, shape or size the quality of Bunting Bronze Bearings is uniform. Continual chemical and physical checks and exacting foundry control by a competent metallurgical laboratory assure this. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in Principal Cities.

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BRONZE BEARINGS ☆ BUSHINGS ☆ PRECISION BRONZE BARS

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DIE MAKING
MACHINES

OLIVER OF ADRIAN

The long life, precision construction and high performance of Oliver Die Making Machines appeal to the discerning tool engineer. The old hand method of die making retarded the end results of production. That is why Oliver Die Making Machines are in operation in the toolrooms of many of the largest industries in the world.

Oliver Die Making Machines are extremely fast and accurate on all sawing, filing and lapping operations. They will save thousands of man-hours for you.

Five different models are available in two sizes.

Write Oliver today for latest technical bulletin on Oliver Die Making Machines — it will show you how to save 60% of your die making costs.

OLIVER INSTRUMENT CO.
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AUTOMATIC DRILL GRINDERS · TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

ROUND TABLE Discussion

TELEVISION EYES

Is Ed justified in firing Thompson without regard to the cause of Thompson's bleary eyes? Well, I would say that most experienced foremen get to know a great deal about most every man they supervise from the general conversation that goes on and also from each man, and I believe that Ed would have known long ago if Thompson had serious trouble at home. Sickness that might have meant sitting up nights with some member of the family, combined with financial worries, could be responsible for Thompson's condition. On the other hand, Ed had occasion to warn him on a previous occasion and if there had been some such trouble that caused loss of sleep and continual fatigue, Ed would have been enlightened by Thompson and Ed would have sympathized with him and helped him if possible. But whatever the cause of Thompson's condition he definitely is not fit to be at work and should stay home or be sent home. If I was in Ed's place I would do so, also I would get one or two of his workmates to find out if there was some dire need that made Thompson come to work when he was unfit, and do what we could by taking up a collection and thus helping a little to ease the financial burden. That course was often taken, even though we knew that the whole trouble was caused by excessive drinking on the part of the bread winner. It's the wife and kids who suffer and if you are helping the man who has caused the necessity for help for his family, it is still worth doing. It may even help him to reform if he is drinking to excess. On the other hand if the trouble is caused by sickness or financial difficulties, you will have helped someone that badly needed it, and that always definitely brings its own reward in lots of inner satisfaction.

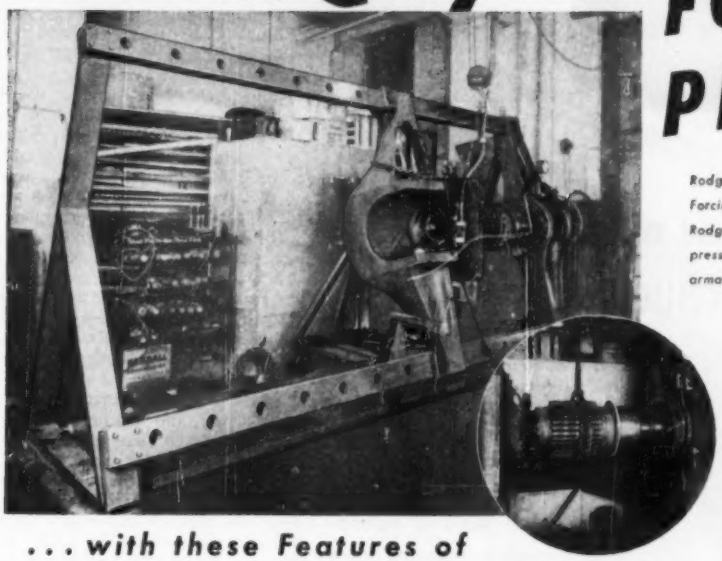
Arthur Silvester
Niantic, Conn.

•

What a man does on his own time is his own business, but the effects of what he does are reflected in the efficiency at work. The employer has no right to interfere in any way with what an employee does outside of working hours providing it doesn't

For Fast, Efficient Pressing Bending, Forming, Straightening...

New Rodgers FORCING PRESSES



Rodgers 300 Ton, 75° Inclined, Stationary Forcing Press, one of many in the complete Rodgers line. In the application shown, the press is being used efficiently to press an armature shaft.

. . . Separate Power Pump

Select your press operating unit from hand-driven pumps or power-driven pumps. Shown is a Rodgers 2-cylinder Power Pump with remote control.

. . . with these Features of Construction and Operation

- **SEPARATE PUMPING UNITS**—Choose from individual hand-operated or power-driven pumps to operate any model Rodgers Forcing Press.
- **REMOTE CONTROL OF POWER PUMPS**—Operator can control press from any desired position.
- **REMOVABLE HYDRAULIC CYLINDER**—Cylinder is easily removed from head member to permit servicing or use for other power applications.
- **INDIVIDUAL FRAME UNITS**—Tracks, tension bars, abutment member and head member are all separate units to facilitate handling and erection of press.
- **EXPERTLY ENGINEERED AND CONSTRUCTED**—All units of Rodgers Forcing Presses are made strong, durable and dependable to give years of reliable service.

. . . In these Types and Sizes

Rodgers Versatile Forcing Presses are available in portable or stationary models—horizontal, vertical, 75° or 90° inclined—100 to 600 tons—with hand-operated or power-driven pumps. In this broad selection, you'll find the ideal press to meet your requirements.

Send for New Catalog...

For full details and specifications on the complete line of Rodgers Forcing Presses send for Catalog 315.

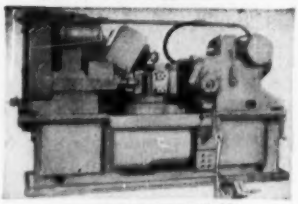
HYDRAULICS Rodgers KEEP THE WORLD MOVING

Rodgers Hydraulic, Inc.

7407 WALKER ST., ST. LOUIS PARK, MINNEAPOLIS 16, MINN.

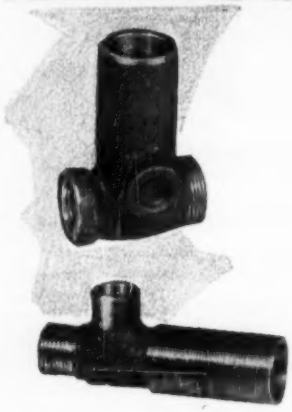
HYDRAULIC POWER EQUIPMENT

GOSS and DE LEEUW
AUTOMATIC CHUCKING MACHINE



means a complete piece... at each index cycle

When a piece is finished it is *completely* finished without the necessity of a second operation. Furthermore it means *more* finished pieces in a given period of time and greater accuracy in *every* finished piece.



The "1-2-3" Method is exclusive with Goss & DeLeeuw. With it, three ends of a piece can be machined at a single chucking of the work, simultaneously or in sequence depending on the operations involved. It will pay you to investigate.

Send for illustrated literature giving detailed information. Send samples and ask us to give you cost estimates of handling this work on a "1-2-3" Goss & DeLeeuw Automatic Chucking Machine.

GOSS & DELEEUW

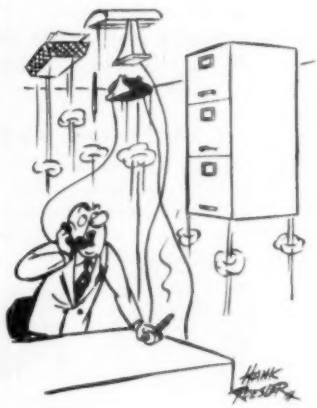
GOSS and DELEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

interfere in any way with his work. If Thompson were a newlywed there might be some excuse for bleary eyes, but ordinarily, if a man reports for work feeling and looking like a washrag the foreman is going to see that he corrects his dissipating habits or make a move to get him pried loose—turnover or no turnover.

This question of an executive objecting to what was done outside of working hours had a practical application many years back when I was employed as a tool designer. It was only a small thing but it had the makings of a good argument. When my right arm was considerably more limber than it is now I used to rush down to the lot at noon and pitch for the boys. The consequence was that I wasn't in the proper physical condition to wield a pencil as a draftsman should. The chief noticed my extreme nervousness and remonstrated with me for my lack of good judgment. He told me in no uncertain terms that I wasn't being fair to him or to the firm.

I took the attitude that what I did on my own time was my own business and I didn't see where he had any right to interfere in my private life. When I think of it now I wonder he didn't tie a can to my tail and send me through the noble portal where I could spend the whole day flinging the trouble-making sphere to my heart's content.

Example No. 2 comes to mind where a buddy of mine ran a lathe in back of my machine. This fellow, while a good lathe hand, lost considerable time from his work on account of his many encounters with Sweet Adeline Bacchus. He'd come to work grouchy as the devil and with eyes that were blurrier than



"How many times must I warn you about hauling that magnet over my office!"

PICK 'EM RIGHT OUT OF THE BOOK...

. . . and still get "something special"

Yes...you may select your required taps from a complete line of Hanson-Whitney *standard* styles and sizes and still get "something special."

And by "special" we do not mean extra-cost, made to specification taps. We mean standard extra quality "finished" taps...ground after hardening to give you the keenest cutting edges, the highest accuracy in lead, angle and diameter. All customary sizes in Hand Taps, Machine Screw, Nut, Tapper, National Hook, Pulley, and Pipe Taps are stocked for fast shipment in protective, clear-labeled, cartoned boxes. For maximum tap life and maintained accuracy, specify H-W.

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You need this Wade

TOOLMAKER'S LATHE

to speed production in '51!

Did you know that in ten years there has been a 25% improvement in efficiency in all bench lathes?*

But the efficiency of this Wade No. 8A

TOOLMAKER'S PRECISION LATHE

is substantially greater than that!

This is due to several features never before available on a lathe with 8½" swing:

VARIABLE SPEED DRIVE • ELECTRIC TACHOMETER

Stepless spindle speeds, with ratio as much as 187 to 1, may be had on special order. Obsolete lathes are expensive to own and operate. Why not plan now to have greater production, higher precision, and *easier operation?*

Ask for the new bulletin on the "*Wade 8A Lathe*".

**McGraw-Hill Study, 1950*

Wade TOOL CO., 83 River St., Waltham, Mass.

the blurriest. The boss, a regular Milquetoast, complained about it to him, but old live-to-the-limit would only throw over his shifter and strut away to the washroom without saying a word in reply.

I tried to impress upon him that he wasn't shooting square with the firm, himself, or his wife and lovely daughter. I might just as well have tried to talk to a block of granite. On one of these occasions, or sprees, later on something happened that very nearly cost him his life and as a consequence he got hold of himself. Incidentally, being in a clearer frame of mind he immediately proceeded to find himself a better-paying job! Whether the non-drinking successor who probably was steady on the job improved the shop situation is a question.

Shortly after I had served my time (machinist apprenticeship) I got a job in an industrial sewing-machine factory where most of the parts were hand-shaped to patterns. One of the chaps near me sat at his vise and at times actually filed when he was asleep as he dozed momentarily on his stool. I noted the dropping of his head occasionally and had it in mind to say something about it as we rode the ferry across the Delaware on our way home. Fortunately for him the boss busied himself putting the finishing touches to our efforts and did not have the time to do any observing of what was going on in the next room. The strange part of it all was that this chap was all hepped up on gaining members to our organization and I, being a fellow brother, saw fit to complain of his unfairness on the job.

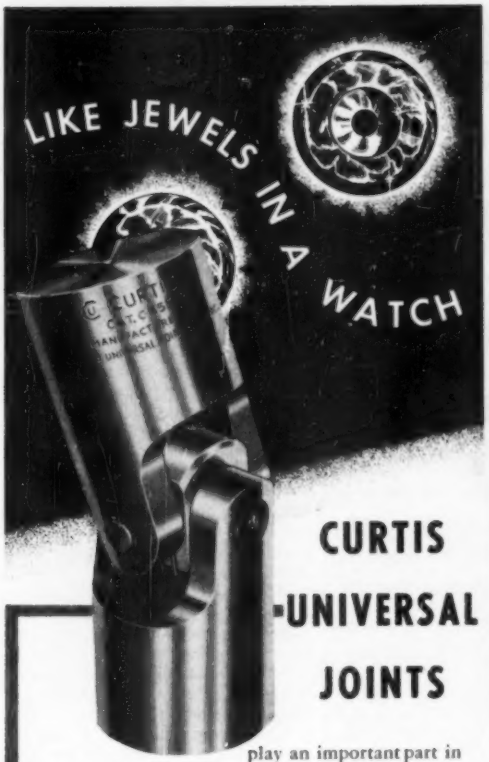
It resolves itself down to this: It is incumbent upon an employee to conduct himself in his private life as he sees fit, but, the rights of his employer are paramount while he is on the job. A workman is rated to the degree of operating efficiency and when he sees fit to reduce it by unnecessary dissipating, he should expect nothing less from his employer than to be put on the well-greased skids.

J. Homewood
Ontario, Calif.

•

LITTLE PLANT SCHOOLHOUSE

THERE is a job for some individual in Washington, while not one to make his name live forever, still would be of immeasurable good to future generations. That is, to pass a law requiring that every reference to the tired shopworn, "You can't teach an old dog new tricks" be



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play an important part in the trouble-free and smooth operation of mechanical equipment.

IMMEDIATE DELIVERY FROM FACTORY STOCKS can be made on 14 standard sizes: 3/8" to 4" O.D., either solid or bored hubs. Whether for heavy duty power transmission or low speed, light duty applications, the high quality and long life of Curtis Universal Joints assures maximum efficiency.

Send us your universal joint problem — giving speed, angle of operation and torque load or shaft size. We'll give it prompt attention. If special machining is necessary, it should be done before assembly; thereby saving you money as well as insuring accuracy and smooth operation.

BE SURE OF THE BEST—BUY DIRECT FROM CURTIS!

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Look for our registered © trademark on every joint you buy.
Send for our new catalog. Write Dept. B-3

CURTIS UNIVERSAL JOINT CO. INC.

When you need the right gear *in a hurry*

It's one thing to get a gear cut exactly to your specifications . . . and another to get it *on time.* To be sure of satisfaction *both* ways, there's only one safe thing to do: specify Grant gears. For, whether you order by 'phone, telegraph or letter, Grant will have just the gear you want on its way in a matter of hours.

Next time a gear breakdown threatens a costly production tie-up, remember Grant's "in-the-pinch" service. Send today for free catalog of "In Stock" gears.

Reduction Units?
Grant has all types.
Write for catalog.

Grant FOR GEARS

GRANT GEAR WORKS, INC.
169 W. SECOND STREET
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LAMINUM* Shims give .002 inch accuracy

WITH AS MUCH AS

.063 inch tolerance

PRECISION ADJUSTMENTS by simply peeling .002 or .003 inch laminations. *LAMINUM* shims available in thicknesses from .006 to .126 inch.

...cutting lathe costs

...saving assembly time

Use laminated shims, stamped from *LAMINUM*, to position machine elements accurately. With a .126 inch shim, made up of .002 inch laminations, for example, you have a full ⅛th inch of adjustment **built into** your assembly. There is NO filing or precision machining or grinding.

FOR SPLIT BEARING of lathe headstock spindle. Even after peeling, shim is always uniform in gauge, with a hard, clean and smooth surface.

PLUS these advantages:

- All adjustments AT THE JOB.
- No fumbling or counting loose shims.
- No dirt, oil, grease between shim layers.
- Less compressible than ordinary one-piece shims.
- No new skill required for use.
- Can be fitted with babbitted lugs to prevent oil and pressure loss.

FOR THRUST BEARING adjustment of pump. Peelable shim is valuable for takeup of wear after service, reducing "down time" for maintenance.

Send today for our new data file with specifications, design factors and applications. Sample of *LAMINUM* included.

STAMPING • GRIDING METALWORKING SERVICES

Press capacity to 100 tons, 24 inches square, shallow draw. Special equipment and variety of dies can eliminate die-making for short runs. Wide stock of materials. Let us quote on your *difficult* jobs.

* *LAMINUM* (Reg. U. S. Pat. Off.) shims are solidly bonded units made up of .002 or .003 inch brass or steel laminations with a microscopic layer of metallic binder. Cut to your exact specifications.

LAMINUM

THE SOLID SHIM THAT peels FOR ADJUSTMENT

LAMINATED SHIM COMPANY, Inc.

3112 Union Street Glenbrook, Conn.

SHIMS SHIM STOCK STAMPINGS AN-COR-LOX NUTS

deleted, censored and erased as one of the most fallacious utterances ever made. When adult and supposedly mature people persist in using it as a mental snifter to salve their conscience for an incipient lethargy and laziness something should be done.

Why this "resistance to change," fear of learning something new, has not been outlawed as an un-American activity is hard to understand.

Failure to learn, observe or copy new techniques is comparable to, "We've done it successfully this way for 98 years, why change now?" Its about as sensible as "My father got about with a horse and buggy—why all these automobiles?" The workpiece on production runs is still being bolted into place instead of using quick-acting clamps. Carbides, if used, are abused. Grinding wheels apparently come in one grit only. Diamond dressers are undersize, oversize and "pointless." HSS is still ground too hot to handle and plunged in the old water can. Here and there even basic safety rules are being given the go-by. In fact it may be said that habits that probably earned many an early day apprentice a well cuffed ear are now so commonplace they are going virtually unnoticed and their mention if made, however discreetly, becomes but a source of irritation taken as a personal affront.

There is of course, to be considered, though by no means used loosely as an excuse, the justification of being irked, on the part of a great number of Ed's in this being hailed off to school if those above them fail to show a good example. The mere appending of general in front of a man's shop title or a complete change to vice-president and higher should not give such a man the highly erroneous impression that with it goes the cloak of infallibility and the sceptre of all knowledge. While there are understandable reasons in the forbidding of certain territory to officers, no one has yet seen fit to, nor should they, proscribe as off limits the "Little Plant Schoolhouse."

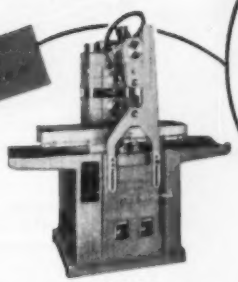
A. M. Elliott
LeRoy, N.Y.

•

WHO PICKS THE BOSS?

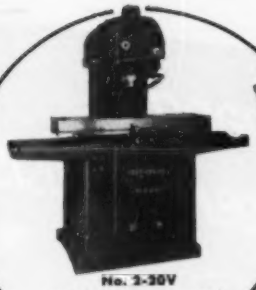
In one large plant newly opened in 1940 with about a dozen inspectors and still adding lots of employees, it was decided to appoint a chief inspector to be responsible for all inspectors. The job required a man with lots of practical experience, a thorough knowledge of figures and government requirements regarding quality and workmanship and the

Rugged...



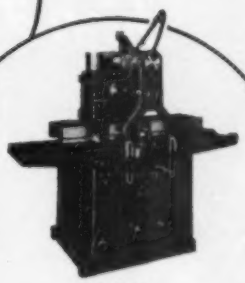
No. 2-200S
Double Spindle for two milling operations at same time . . . 20" table travel . . . 42" x 12" table.

Efficient...

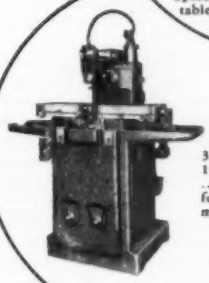


No. 2-30V
20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42" x 12" table.

Simple...



No. 2-30
20" table travel . . . 42" x 12" table . . . full automatic hydraulic table feed.



No. 1-14
32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

Standard
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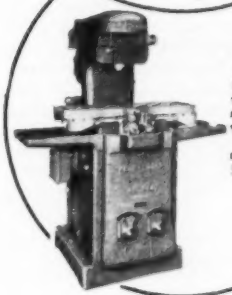
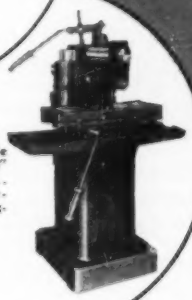
KENT-OWENS
Milling Machines

Write for Bulletins. Kent-Owens Machine Co., Toledo, Ohio.

KENT-OWENS REPRESENTATIVES



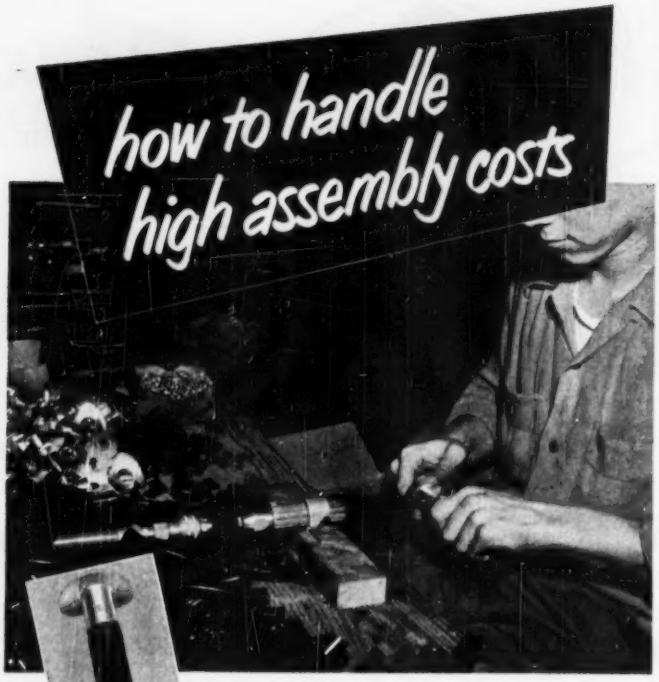
No. 1-14V
14" table travel with full automatic cycle . . . vertical spindle with speed range 115 to 5000 R.P.M.



No. 1-M
Hand feed to table and head . . . 25" x 9" table . . . 1 H.P. . . . head counterbalance is adjustable.

No. 1-V
Hydraulic vertical head feed . . . 5½" head travel . . . 25" x 9" table.

No. 1-B
8" table travel . . . 25" x 9" table . . . full automatic hydraulic table feed.



KURZ-KASCH, Inc.

DAYTON, OHIO

• On an order for 120,000 plastic handles, to which metal sockets had to be attached, Kurz-Kasch, Inc., pioneer planners and moulders in plastics, found that manual assembly methods averaged only 125-150 units per hour per man . . . ran assembly costs dangerously high.

Converting to Buckeye air-powered screwdrivers, Kurz-Kasch stepped up productive output to 225-250 units per hour—a 66⅔ % increase that kept assembly costs in line, assured a profitable production operation.

In any business—including yours—there's a real need for efficient, modern Buckeye Air Tools. Screwdrivers, drills and nut runners . . . grinders, buffers, sanders . . . wrenches, shears and nibblers . . . there's a Buckeye Tool to do your work—faster, better, more economically. We'll prove that—in your plant, on your job—without obligation. May we call on you?

Buckeye Tools CORPORATION
DIVISION 15 • DAYTON 1, OHIO

Portable Air and Electric Tools for Industry

inspectors already employed, were thoroughly considered. None filled the bill. An advertisement was put in the local paper. Somehow the inspectors got wind of this and sent in a deputation to the management and demanded that one of their number be given the job as chief inspector. They were informed that they were interfering with something that was none of their business. Also that there was no alternative as there was not one of them had all the qualifications necessary to fill the bill.

On returning to the shop the inspectors tried to get the shop steward to call a stoppage of work. They were unsuccessful and that was the end of that.

A chief inspector was brought in, proved a great success from the start and was with the concern for several years.

I am a union member of nearly 47 years standing, took an active part for many years. While I believe that employers should often be more communicative to their employees in matters that would really be interesting to them, such as a prospect of business or in the case of something drastic being done, or a major change of policy, I don't think any body of employees should have any say on anything as to the choice of a foreman. Further, I know from life-long experience in many shops that the vast majority of employees never bother their heads about who shall or who shant supervise them. Their attitude is wait and see how he shapes up and how we get along with him and he with us.

If employers ever gave away their right to say who shall be appointed a boss, or if the union shop steward

"Probably some new-fangled backless coverall—on the other hand, though, it just might pay us to check."

Fasten it with STAINLESS STEEL

for Better Looks – Longer Life

LEADING PRODUCERS OF FASTENERS USE ALLEGHENY METAL

A complete line of stainless steel fasteners—all types and sizes of bolts and nuts, rivets, wood and machine screws, cotter pins, washers, etc.—are made of Allegheny Metal by the leading manufacturers in this field. Get in touch with them for catalogs and prices, or write us direct.

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Allegheny Metal fasteners are non-rusting, non-staining. They will last as long as, or longer than, the materials they join. You can count on them to stand up through the years—both in strength and in bright good looks.

Best of all, stainless steel fasteners can be used anywhere. It isn't necessary that the materials to be joined are stainless—these corrosion-proof fasteners are the perfect answer for joining other metals, woods, or plastics. And Allegheny Metal fasteners are available in complete variety—you can obtain exactly what your job requires.

For improving quality and reliability wherever they're used—and for the economy of lifetime service—specify fasteners made of the time-tested stainless steel, *Allegheny Metal.*

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Nation's Leading Producer of Stainless Steels in All Forms

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ALLEGHENY METAL is stocked by all Joseph T. Ryerson & Son, Inc. warehouses

Now, a high strength ALLOY that Machines Easily

NEVER before an alloy steel that offered you these combined advantages! With Ryerson Rycut you can speed up production—reduce down-time—get a better surface on your machined product! This remarkable medium carbon alloy machines 25% to 50% faster and at much higher tensiles than other alloys of the same type! It actually doubles—may even quadruple tool life! And grinding is often unnecessary because many parts may be finish machined.

Though offering you all these advantages, the initial cost of Rycut is practically the same as that of standard medium carbon alloys!

Rycut responds uniformly to the conventional oil-quench method of heat treatment. It may also be flame or induction hardened. And when heat treating Rycut, your Ryerson alloy certificate guides you to the required results.

Rycut is available for prompt delivery—annealed or heat treated—in rounds, flats or squares. For test samples or production requirements, contact your nearby Ryerson Plant.

CARBON, ALLOY AND STAINLESS STEELS IN STOCK

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • DETROIT
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obtained the power to say who shall be appointed, or even if the men in any shop have that prerogative, I believe that such a change would cause chaos, inefficiency, ultimately ruin the industry, cause a complete collapse, and profits would entirely vanish. This of course would in turn mean shut downs, vast unemployment, and everybody loses.

Why is that so? Well if employees ever got to choosing their own foreman very soon they would want to choose the superintendent and every other official connected with the company, and if they did get to the point where this happened, they would be saying to these appointees: "We chose you for the job but don't forget also that if you don't play ball we can also fire you." Fantastic as this may seem, it can happen. As a matter of fact there are lots of shops today where union shop stewards tell the management what has to be done or else. They win their demands often when it is entirely unfair and I have known several instances where these demands have not had the backing of the employees and if they had been consulted would not have gone along with the shop steward.

In conclusion, if the plant where Al and Ed are employed was cooperatively owned by the employees, then the shareholder employees have the right to say who shall be boss, because it would be their own money. Seeing that is not the case in this instance, it is none of the employees' business and Ed should be informed that his services are no longer required.

In one word, fire him. Reason: disloyalty.

Arthur Silvester
Niantic, Conn.

•

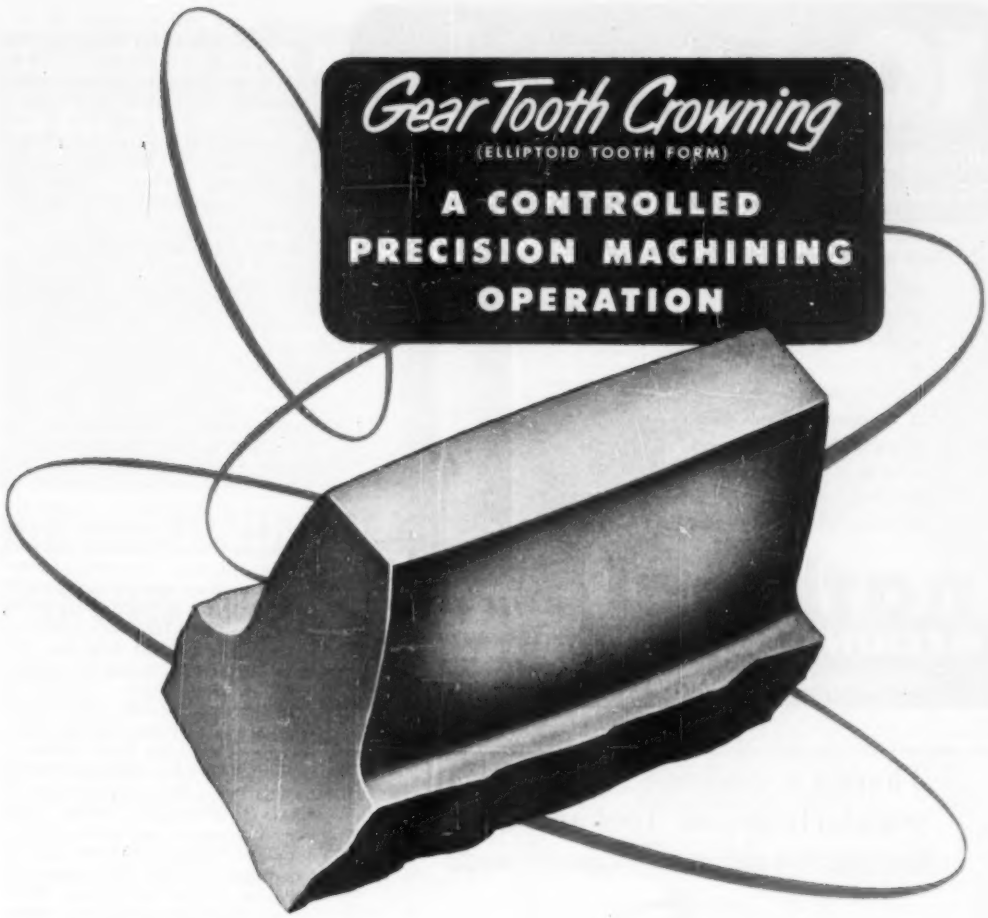
OVER HIS HEAD

ADVANCEMENT should come through recognition of unusual ability and initiative. Robertson should have been kicked for encouraging anything that savors of underhandedness. A man in his position should have used executive tact and told the man, "Why, take it up with the foreman; he's the man to decide that." Such an attitude on the superintendent's part would have settled the matter then and there—gently setting the informant back in his proper place and letting him know, without hurting his feelings, that he wasn't a party to any underhandedness. There is the temptation, for one in Robertson's position, to en-

Gear Tooth Crowning

(ELLIPTOID TOOTH FORM)

A CONTROLLED PRECISION MACHINING OPERATION



Gear tooth crowning (Elliptoid Tooth Form) is used for just one purpose—to prevent "end bearing," which is a concentration of operating load at the end of the tooth where it is most vulnerable to failure.

Crowning is the only way to prevent end bearing because with any gear assembly it is impossible to maintain accurate gear alignment under all conditions of loading. Shafts, bearings and mountings are all elastic. Even the slightest deflection will cause misalignment and end bearing in gears with conventional teeth.

Many of the leading automotive gear plants have standardized on crowning to raise the factor of safety of gear teeth and to reduce operating gear noise. Crowning does both successfully.

Crowning accomplished on Red Ring Gear Shaving Machines is a precision machining operation by which the maximum amount of crown is always under positive control. Tolerance control is indicated by a typical routine check of a lot of 4000 gears having the following specifications: 1" face, 18 teeth, 13.5 Nor D.P., 20° Nor P.A., 27° H.A. and .0003" to .0005" crown. An adequate check failed to reveal any unit outside the .0002" tolerance on crowning.

WRITE FOR BULLETIN S49-5 FOR A MORE DETAILED DISCUSSION OF GEAR TOOTH CROWNING

5621

NATIONAL BROACH AND MACHINE CO.

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

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- in offset holes.
- that are straight.
- with parallel sides.
- partly through holes.
- for interchangeable parts.
- without clamping the work.
- of standard width and depth.
- in holes that are closed at one end.
- where keyseating machine can't reach.

national
MACHINE TOOL CO.
CINCINNATI 22, OHIO

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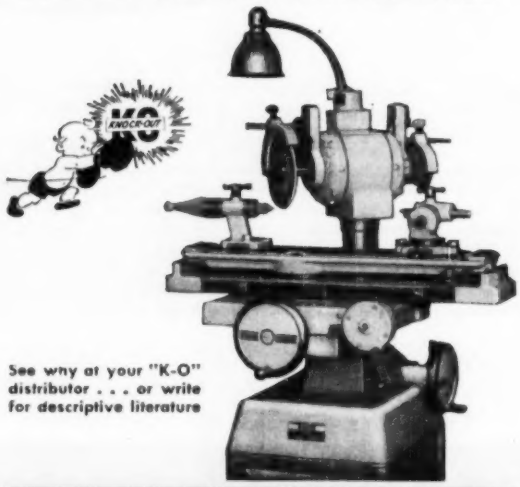


See why at your "K-O" distributor . . . or write for descriptive literature

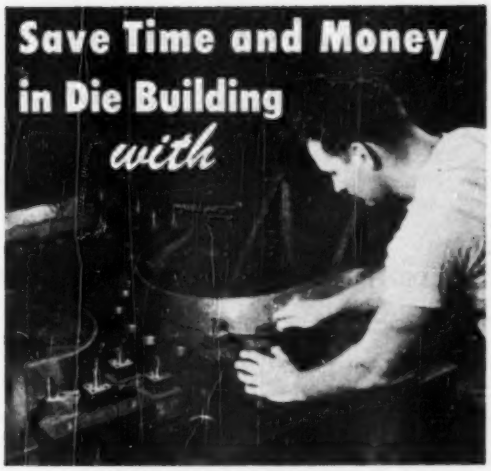
K. O. LEE CO.
ABERDEEN, SOUTH DAKOTA

courage the man to impart the information direct—especially is this very pleasing in the event that one is looking for an excuse to have something on another. You can't have a smooth-running organization if you permit short circuits all around the plant. There must be direct authority and this authority should be made clear to any man who is employed.

It struck me when I read the footnote to the Round Table where it said, "Should a man be prevented from going upstairs first?" because of a very amusing, yet annoying, experience I had during the heyday of my industrial experience. It so happened that I was given a job of boring out a large jig plate for a bottle-washing machine and inasmuch as we had no machine large enough to handle it I had to use one of the Becker vertical boring mills out in the main shop. I had no sooner got my job set up and was ready to start operations when I detected an error in the drawing. Obviously, I consulted my boss who in turn took it upon himself to get in touch with the draftsman. With that little difficulty straightened out, the field was left clear for production, but lo, another difficulty arose! Again I spoke to Fred and again he climbed the long, straight flight of stairs to the engineering department. Fred had more to do than spend all his time chasing up and down stairs, and besides, it was a tiresome job. Finally, after detecting some more errors in the drawing—the guy that made it must have had a pretty stiff hangover when he did his calculating—Fred, in a mood of profound disgust, threw up the sponge. "Ah, ta hell with it—Jack, you go up yourself and consult with Bowers; what's the use of me wearing my legs out when you're lots younger than I am?" Well, by the time I had finished the job I had to make quite a number of trips and as a consequnce was on pretty good terms with the draftsman and the big chief who injected himself into the discussions.

Whether Fred thought that I was horning in on his job or not I do not know but from then on his attitude toward me felt like a breeze coming from the North. It was not long after that an incident occurred that fitted into Fred's well-plotted plan and I was let go. My toolbox was inactive for about 24 hours and I was employed elsewhere at a better wage and better surroundings.

One thing I was certain of, and that was that from then on I would attend strictly to business and not encourage any activities that would



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R-B punches and dies cut die-making costs because they permit use of *standardized* R-B retainers which are quickly and accurately mounted. Completely interchangeable, R-B punches and dies consequently reduce large inventories.

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*Richard Brothers

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High carbon steel, bronze, aluminum, stainless steel, monel metal, spring lock washers . . . finished or plated with cadmium, nickel, brass or copper. Also Garrett's Aluminum Spring Lock Washer—light in weight with strength of steel.

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Made to meet ASA and SAE specifications in regular steel spring steel, stainless steel, brass, bronze, monel metal, aluminum, Alclad and copper. Can be plated with zinc, cadmium, nickel, brass, chrome . . . or can be parkerized.

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OF PENNSYLVANIA

likely enrage the man I was working for. I had come to the conclusion that to go over a foreman's head was to cut off my own.

John Homewood
Ontario, Calif.

•

Looks like Ed was not doing a very good job in supervising his personnel. Usually that is the basic reason when men desire to go over the head of their supervisor. If they cannot get satisfaction from their boss they will look elsewhere for it. It is true that too many higher supervisors just delight in bypassing the lower supervision and discuss problems with employees in the shop. This is also bad management. You ask how can a foreman stop this type of thing?

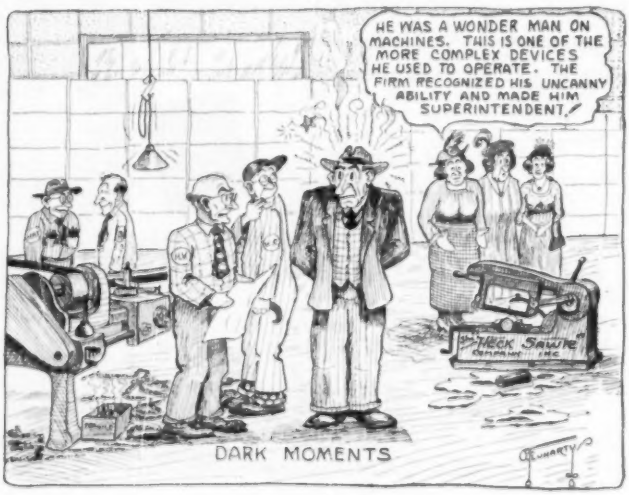
Well, it is admitted that it is rather difficult, but it can be done if the foreman wishes to exert himself. It will require many long hours of hard hammering at the higher officials and careful working among the hourly employees in the shop. Perhaps a lot of the other foremen are having the same trouble. If so your attempt to straighten out the superior that likes to be a big shot to the worker and solve all his problems himself is much easier. Get all your friends together and have your facts cold, then request a meeting with your superior whether he is the culprit or not. If he is the one who is causing trouble, have it out with him. Tell him what he is doing and why you object. Point out cases where workers actually are becoming beligerent as a result of his actions. Explain how no organization can exist if foremen do not control their workers. Make it clear that your group is going to resist his action. Then follow through. Each foreman has his duty to perform. Check on the executive to see that he does not continue his practices. If he does, go after him again and again. By and by, he will see his error.

In such a battle it is always well to enlist as much help from other staff members as you can. Also, don't neglect your workers. Do everything in your power to serve them and give them preferred service. In this way they will have no complaints.

Remember always that an organization has to work both ways. The steps go both up and down. Try always to keep on each step. Don't overstep someone yourself and then you may expect them to give you the same courtesy.

Now, a word to you foremen who are troubled by men bypassing you and whose supervisors do not like the idea. Better sit down and analyze yourself. Why haven't your men been coming to you with their problems? Is it because you have brushed them aside? Is it because you don't follow through and get them an answer after you had promised you would? Did you make an error in judgment which was not upheld by your superior? Could it be that you are losing touch with your men because you are getting too big for your job? Perhaps you feel that because you are a foreman it is your job to push people around.

Again I say, think the thing through for if you don't some day someone else will be working at your job and you will be on the outside looking in. No foreman or supervisor, no matter how good he may be can ever last indefinitely if his men bypass him continually. You say you have seen it happen. Yes,


HE WAS A WONDER MAN ON MACHINES. THIS IS ONE OF THE MORE COMPLEX DEVICES HE USED TO OPERATE. THE FIRM RECOGNIZED HIS UNCANNY ABILITY AND MADE HIM SUPERINTENDENT.
DARK MOMENTS

FERRACUTE ECONOMY IS BUILT INTO THIS 350-TON STAMPING PRESS

Low-cost production of a great variety of large forms involving stamping or shallow drawing is possible with this Ferracute press. Simple, trouble-free operation and long wear with amazingly low maintenance are characteristic of this as of all Ferracute presses during the past 87 years.

Economy is built right in. The press illustrated is No. SGGF-9-108. It is a 350-ton, double crank, double twin geared, straight side, tie-rod construction Stamping Press. The box type head is of massive one-piece construction, a high-grade semi-steel casting. The main shaft, middle shaft, and clutch shaft are supported entirely by the head, and are mounted in anti-friction bearings.

FERRACUTE COMBINATION FRICTION CLUTCH

Press No. SGGF-9-108 includes the Ferracute single unit combination friction clutch and brake as standard equipment. Clutch is air actuated and electrically controlled to permit inching, single-stroke with anti-repeat feature, and continuous operation. Clutch adjusting ring and clutch floating plate are made of wear resistant nitralloy steel. A unique arrangement of vents in the flywheel provides low operating temperatures. Replacement of clutch and brake facings quickly made without disassembly of clutch from shaft.

STANDARD EQUIPMENT

Floor level automatic lubrication system. Motorized ram adjustment. Pneumatic ram counter balances. Bed of press arranged to accommodate standard die cushions. Press as illustrated is equipped with plain, steel plate bolster and ram arranged for triple bar knockout. Innumerable other applications are possible. Presses of this type are available from 150 to 400 tons. Write for full specifications.

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Since 1863, builders of mechanical power presses, and special machinery.

PRECISION GEARS

(AN ARGUMENT)

Does any mechanism operate at top efficiency when its power is transmitted through inaccurate gears? Then why are you so liberal with the tolerance you allow in the forming of your gears? Wouldn't you *rather* have precision gears if you could secure them at the same cost?

HERE'S NEWS FOR YOU!

The Hamilton No. 1 Gear Hobber is a machine designed for the forming of small, *super-accurate*, spur, spiral, bevel, worm, and face gears. (By small gears we mean gears of six inch diameter or less). It is of extra rigid construction, for the maintenance of accuracy, and embodies the unique feature of independent speed, feed, and indexing selection. This last named feature greatly facilitates set-up. In fact, it reduces the time consumed to a point far below what is normally considered minimum.

Thus, as you will perceive, the Hamilton No. 1 Gear Hobber is a machine, the principle of which eliminates the possibility of indexing error; the rigidity of which maintains accuracy and encourages heavy production loads; the setting of which speeds production both by conserving set-up time and by allowing maximum cutting speeds on all materials; and the accuracy of which is reckoned to .0002". If more accurate gears would be advantageous to your operation, you should know more about the Hamilton No. 1 Gear Hobber.

We will be glad to supply engineering information about the application of the Hamilton No. 1 machine to your particular job. Communicate!

Also ask for our Bulletin H 1-49. It illustrates and explains the Hamilton No. 1 machine in detail.

DEALERSHIPS are still available in eight territories. Write for information.

THE Hamilton TOOL COMPANY

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so have I, but where has it hppened. In the smll companies that are poorly managed and where all officials keep stepping over each other and no one knows who is boss. The entire company seems to be built on the policy of "confuse, divide and conquer." But have you ever found any of these companies to be leaders in their field? Doesn't their own internal situation keep them from advancement and growing? If you study these organizations you will find that they could be making a great deal more money (profit) if they operated soundly and had harmonious relationships within the organization.

Charles D. Townsend
West Hartford, Conn.

NEW BOOKS

SPECIFICATIONS FOR STAMPING AND DIES—*Published by Kickhaefer Mfg. Co., 901-903 South 2nd St., Milwaukee 4, Wis. 7th Edition. 46 pages, 8½ x 11 in., spiral bound. Free.*

A collection of data sheets containing engineering drawings and specifications for metal stampings that can be produced to the user's requirements without die changes.

Included are tubing and wire clamps, spring anchors, expansion plugs, oil slingers and guards, washers, bearing retainers, lockwashers, and other standard items.

•

ALUMINUM STRUCTURAL DESIGN — *Published by Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky. 1950 Edition. 130 pages. Free.*

The design of load-carrying structures in aluminum is covered in this book. Chapters include basic data on figuring tensile, compressive, bending, and shear stresses, cylinders subject to fluid pressure, fabricating considerations, deflection, and vibration problems.

There are 66 pages of tables giving information on physical, chemical, and mechanical properties, formulas, available forms, and other data.

•

STEEL CASTINGS HANDBOOK—*Edited by Charles W. Briggs, Technical and Research Director, Steel Founders' Society of America.*

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LONG SLIDE *Precision* POWER PRESSES

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	OLD METHOD		NEW METHOD	
Grinding Fluid	Soluble Oil		SuperKool 81X Grinding Oil	
Material and Hardness	Steel Forgings Rc 30-36			
Stock Removal	VALVE STEM Finish Grind .004"-.006" in 2 passes	VALVE FACE Rough Gr .006"-.008" Finish Gr .004"-.006" in 2 passes	VALVE STEM Finish Grind .004"-.006" in 1 pass	VALVE FACE Rough and Finish Grind in 1 pass .014"
Average Production per Wheel Dressing	350-400pcs.	300-350pcs.	2000pcs.	1200pcs.
Total Life of Wheels	Maximum of One Week		Eight Weeks	
Grinding Fluid Cost on Machine	About $.02 per gallon		$.66 per gallon*	

*This figure does not take into consideration the reclaiming of straight oils which usually reduce the cost at least 80%.

Price per gallon is not the measure of a cutting fluid. The right oil for the job is the one that produces the best results. In this instance, it is obvious that the application of an inexpensive soluble oil was incorrect for the job and the application of a more expensive grinding oil was 100% right. Ask to have a Stuart sales engineer show you how the right oil for the job can improve your efficiency. Write for the latest literature on cutting fluids.

D.A. Stuart Oil Co.

2729 S. Troy Street, Chicago 23, Illinois

Published by Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15, Ohio. 511 pages. Price $4.

This edition has been extensively revised. In addition to a brief history, it includes chapters on classes of steel castings, applications, design, manufacture, heat treatment, mechanical properties, physical values, and engineering properties, purchasing and specifications.

The handbook will be of primary use to the producers and users of steel castings. The information on machining and welding is brief and rather general. However, the book is thorough on the basic subjects.

Improving the Job of Improving Methods

"OUR WORK is not exempt from methods improvement just because it does not consistently fall into the same pattern day after day," explained Charles Winkelman, industrial engineering supervisor, Belden Manufacturing Co., before The Society for the Advancement of Management.

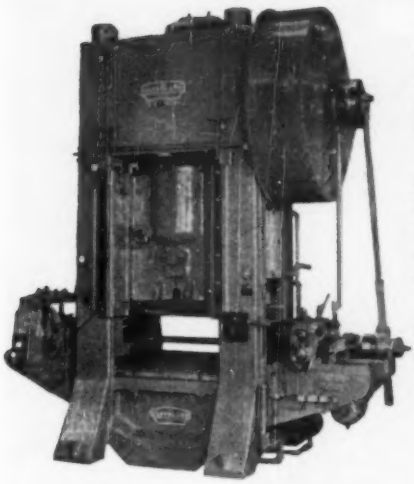
"We usually think of methods and cost reduction as the improvement of manufacturing methods and the reduction of manufacturing costs. The methods I am going to discuss are the ones that we use in our industrial engineering work; for if we improve our own work methods we make more time available for working on manufacturing methods and increasing our cost reduction output.

". . . There are five basic steps in cost reduction: (1) analysis of the present method, (2) development of the improved method, (3) computation of the cost change, (4) preparation of the proposal for obtaining adoption approval, and (5) reporting the accomplishment. . . . A bird's eye-view would show that (improvement work) falls into three categories: skilled work, creative work, and supporting work.

Methods for reducing supporting work are: "(1) instructions are put into writing, (2) work activities are scheduled, (3) practices are standardized, (4) routines are systematized, (5) printed forms are used for routing clerical work, (6) work is delegated to persons of lesser skill."

"Systematizing the routine supporting work reduces the time it requires, or permits delegation to less skilled personnel. The result is: more time for the use of our skills and creative ability for reducing manufacturing costs."

"Step-up" production—cut manufacturing costs with CLEVELAND PRESSES



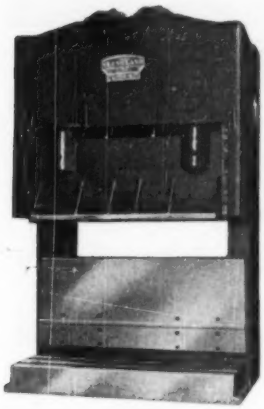
EVERY manufacturer of sheet metal products interested in stepping up production and reducing manufacturing costs will find it advantageous, as many other leading manufacturers have, to install Modern Cleveland Presses designed for speed, accuracy and economy of operation.

The many improvements included in the advanced engineering of Cleveland Presses have not been confined to any one type or size of Cleveland. Every new Cleveland offers *longer die life, increased accuracy* and *minimum maintenance.* The valuable knowledge gained in over 60 years, as builders of precision metal working tools, has enabled us to include vital improvements in each of the eleven types of Cleveland Presses.

Therefore, if you are considering replacing any of your present Press equipment, or installing additional Presses, it will pay you to get the complete specifications covering suitable Cleveland Presses.

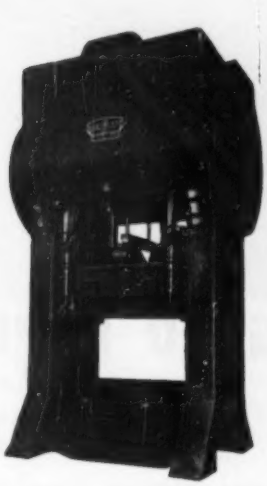
SINGLE POINT STRAIGHT SIDED PRESS EQUIPPED WITH DOUBLE BACK AND PINION ROLL FEED

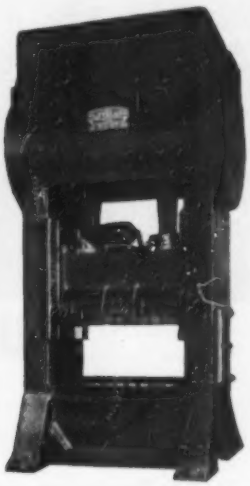
Stroke	3"
Adjustment	6"
Shut Height	28"
Face of Slide	34" x 40"
Area of Bed	42" x 48"
RPM	45"
Capacity	600 tons



TWO POINT OPEN BACK GAP PRESS

Stroke	12"
Adjustment	8"
Shut Height	54"
Face of Slide	30" x 84"
Area of Bed	32" x 100"
RPM	30
Capacity	125 tons





TWO POINT DOUBLE ACTION TOGGLE PRESS

	SLIDE	BLANKHOLDER
Stroke	23"	15"
Adjustment	5"	5"
Shut Height	37"	35"
Face of Slide	34" x 56"	45" x 66"
Area of Bed	45" x 72"	
Capacity	200 tons	120 tons

TWO POINT STRAIGHT SIDED PRESS

Stroke	12"
Adjustment	8"
Shut Height	36"
Face of Slide	48" x 60"
Area of Bed	48" x 60"
RPM	30
Capacity	300 tons

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FABRICATING TOOLS

POWER PRESSES

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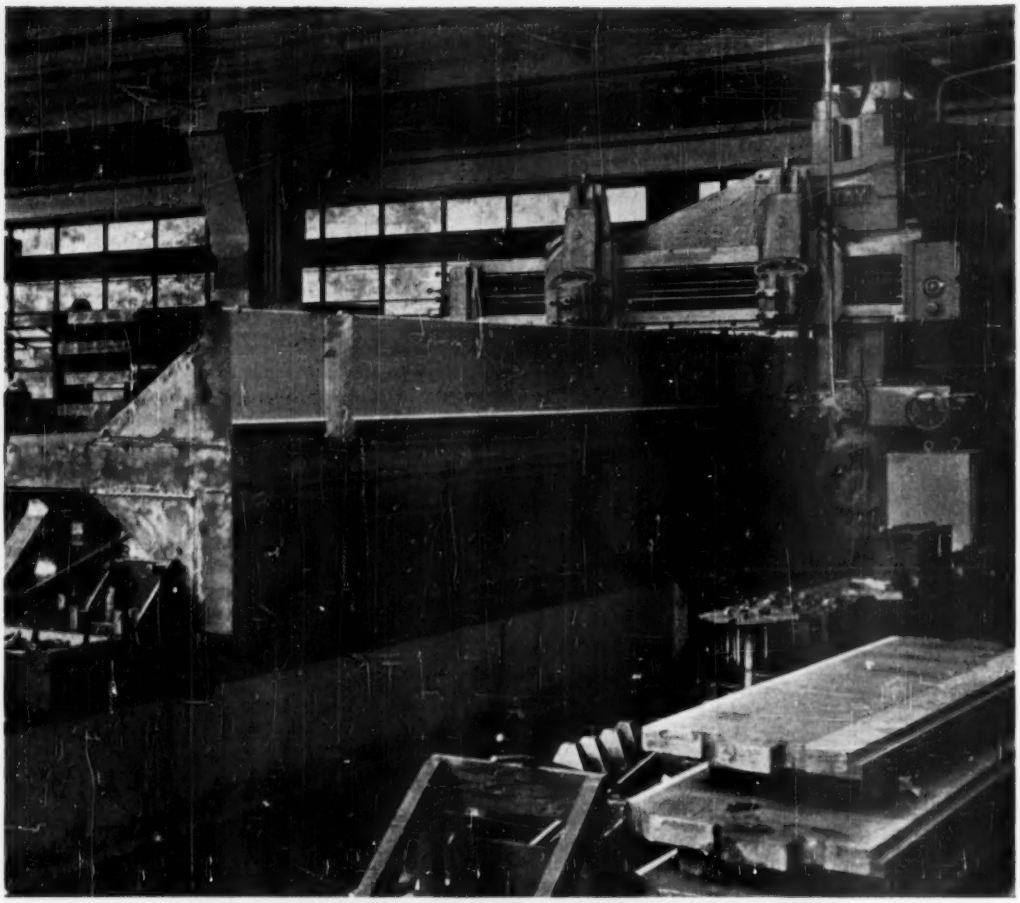

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GRAY PLANER

Heavy Production requires enormous power and a trouble free design.

The 66,000 Lb. steel bed weldment for a 400 series Cincinnati Press Brake presents a tough machining problem.

This new Heavy Duty GRAY Openside at the Cincinnati Shaper Co. offers the ideal solution for fast, economical production.

You, too, can speed production with GRAY dependable accuracy and high table speeds.

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planers • milling planers
planer type milling machines
horizontal boring machines

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No Other Finishing Method Compares...

IN SPEED— EFFICIENCY— COST PER DIE!

ABRASIVE No. 5AWF

INTERNAL FINISHER FOR CARBIDE DIES

Here's a complete carbide die grinding service in one machine . . . offered exclusively by ABRASIVE! It performs all 8 finishing operations at one setting — produces a true hole of 2 RMS microinch smoothness or better without lapping, honing, or polishing. In 60 seconds, it can remove .025" stock from a ½" hole, without leaving any chatter or "bell mouth" condition. Both straight and angular surfaces are ground on the periphery of the wheel, utilizing a reciprocating grinding action across the work surface.

Multiple Wheel head slides permit grinding 2 angles or straight holes and tapered holes . . . at the same time.

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The No. 5AWF was developed in the last war expressly for finishing the carbide dies from which cartridge shells are drawn. Its patented, reciprocating wheel slide motion has revolutionized the production and accuracy of these dies.

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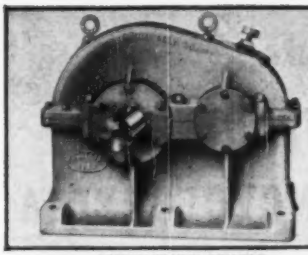

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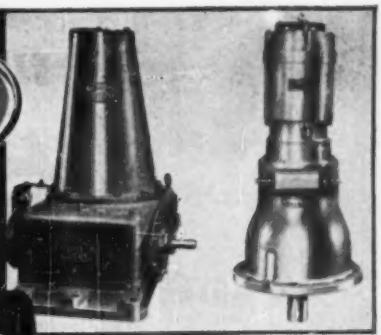
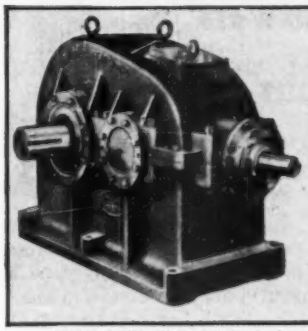
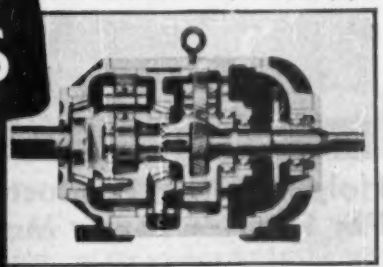


Steeple Type WORM REDUCER

VERTICAL MotoReduceR (With Planetorque)



SPIRAL BEVEL (Helical & Herringbone)



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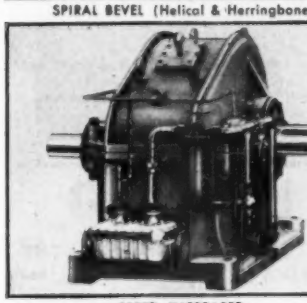

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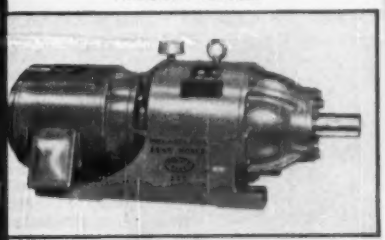
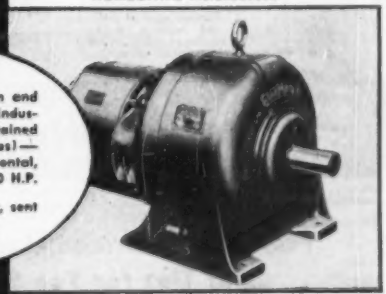


HORIZONTAL MotoReduceR

WORM GEAR REDUCER



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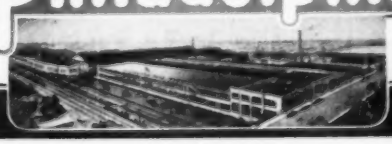

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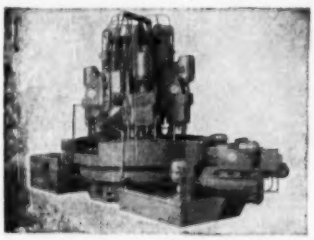

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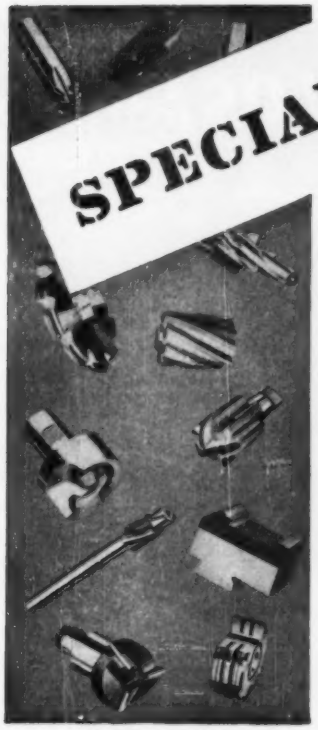

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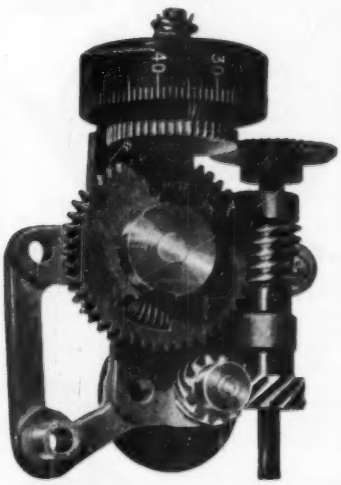

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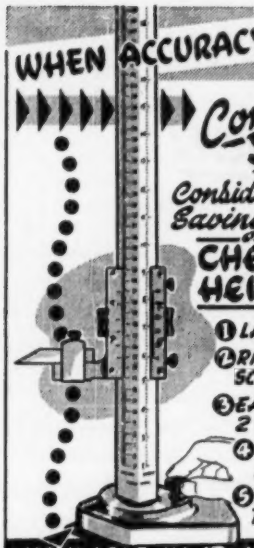

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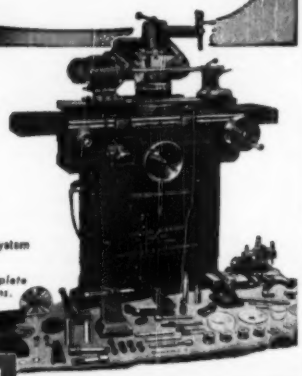

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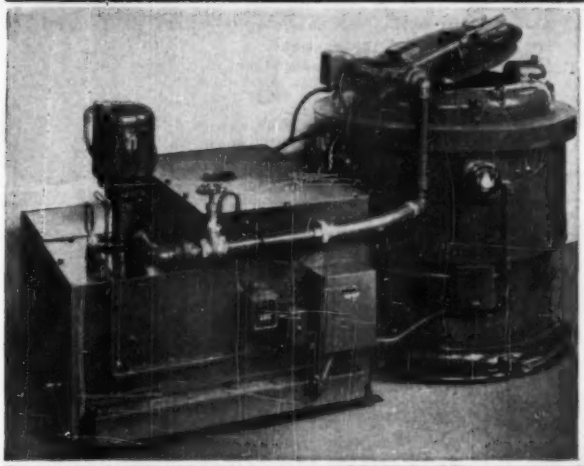

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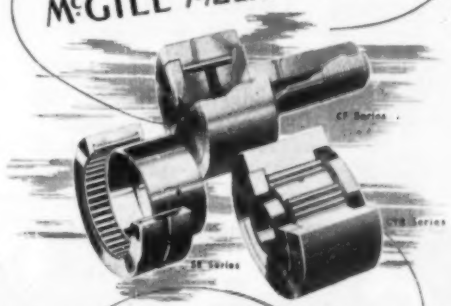

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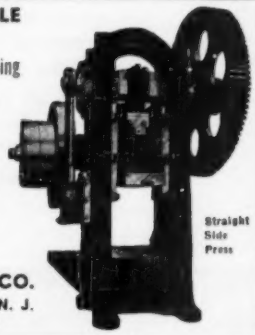

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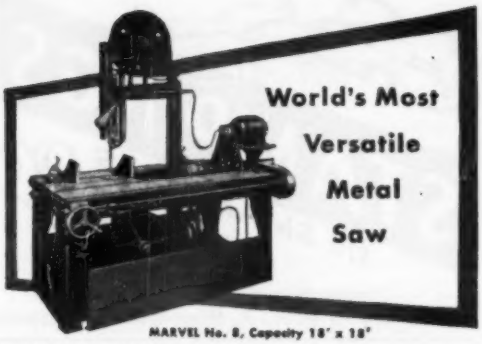

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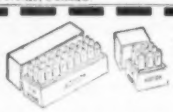
Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on Page 50 Feb. 10, '49 American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Pacific Coast Representative: A. C. Behringer, 334 N. San Pedro St., Los Angeles, California. Canada: F. F. Barber Machinery Co., Toronto, Canada.

TOUGH STEEL STAMPS



WE KNOW THEY'RE TOUGH BECAUSE WE MAKE THEM THAT WAY.

● This is the kind of Stamps your Tool Makers and Machinists keep under lock and key.

The ACROMARK Company

7-13 MORRELL ST., ELIZABETH 4, N. J.

LUERS Patented Cutting Off Tool Holders Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of burnishing chips — MEANS MAXIMUM CUTTING EFFICIENCY

Manufactured By

J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.

Produced under License Issued by John Milton Luers Patents Inc.

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1 in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

A complete three stage STAMPING IN 18 SECONDS

The work shown illustrates the drawing of a half-tank section 14¾ inches in diameter and 24 inches deep from a 38½ inch blank 0.105-inch thick. These half-tank sections can be produced by the Schnell continuous process at the rate of one completed section in 18 seconds.

This ingenious process turns out a finished shell of better metallurgical properties in that there is less metal distortion and a pronounced absence of thinning resulting in a more uniform wall thickness. Thus you get a better product, in less time at lower cost.

★

Write for full descriptive bulletin or consult us direct on your deep drawing problems.

SCHNELL TOOL & DIE CORP. — Salem, Ohio

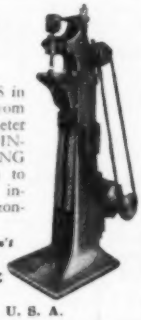
GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.

85 Silliman Ave., Bridgeport, Conn., U. S. A.



PUMPS IN COMPLIANCE WITH J. I. C. STANDARDS

PIONEER Pumps

HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

FOR EVERY INDUSTRIAL COOLANT AND LUBRICANT APPLICATION

PIONEER PUMP & MANUFACTURING CO.

19651 John R Street • Detroit 3, Michigan

Better Service from Your Mechanical Presses

You can operate and service your mechanical presses more efficiently if you are fully familiar with how they function, how they are constructed, and what their maintenance problems are most apt to be.

Sergius D. Brootzkoos gives you all the answers in an *American Machinist* Special Editorial Report: How Modern Mechanical Presses Operate. Reprints of this valuable report are available at 25 cents a copy. Write to . . .

American Machinist

Reader Service Department

McGraw-Hill Building, New York 18

New SAMSON ANGLE BENDER

with quick-grip clamping device

Hardened steel replaceable jaws • Stop gauge for setting angles • Quick adjustment for thickness

Fast • Accurate • Easy to operate

PROMPT SHIPMENT

Write for catalog

$65.40
(Subject to Change)
f.o.b. New York

Capacity:

3" x ¼" flats	¾" rounds
⅛" squares	3" x 3" x ¼" angles

JULIUS BLUM & CO., Inc.

532 West 22nd St. New York 11 • WAtkins 9-7042

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE
(Not available for equipment advertising)
$1.20 per line, minimum 4 lines. To figure advance payment count 5 average words as a line.
POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.
PROPOSALS, $1.20 a line an insertion.

INFORMATION
BOX NUMBERS count 1 line additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE
The advertising rate is $10.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. A.M.

NEW ADVERTISING received by 10 A.M. Dec. 21st will appear in the issue of January 8th subject to limitation of space available

ATOMIC POWER

WESTINGHOUSE ELECTRIC CORPORATION

IMMEDIATE OPENINGS

For experienced senior and junior engineers

- Servomechanism designer experienced in gear trains, bearing applications, differentials, etc.
- Mechanical engineer, materials experience in wear, corrosion, etc.
- Application or design engineer experienced on hydraulics (pumps, hydraulic motors, flow, calculations).
- Process control engineer, capable of making system study of hydraulic circuits, valves, etc.
- Engineer, experienced in aircraft hydraulic control, remote indication, etc.
- Mechanical designers of complete systems in the instrument servo range.
- Process control engineer to design complete servosystems involving all auxiliary apparatus and all controls.

For application write
Mgr., TECHNICAL EMPLOYMENT
306 Fourth Ave., Pittsburgh 30, Pa.

PRECISION MACHINISTS TOOL AND DIE MAKERS

Work For
HUGHES

Security in long range program
Newest equipment in modern laboratories and shops
Opportunity to work with nationally outstanding scientists and engineers

Mail request for application to:
HUGHES RESEARCH AND DEVELOPMENT LABORATORIES
Culver City, Calif.

SENIOR ENGINEER WANTED
By consulting engineering firm located in New York City. Must be graduate of recognized engineering college with manufacturing experience in metal working industry as Plant Manager or Assistant Plant Manager. Age 35-45. Give age, education, experience, references and salary required. All replies kept confidential.
P-8192, AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.

SUPERINTENDENT

For Eastern Precision Gear Mfr.

Must be production and quality minded. Thoroughly familiar with machine tool design.

Age between 35-40

Write educational background, previous experience, give references, similar positions, excellent opportunity for wide-awake individual.

P-8510, AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.

J. L. OVERHOLT
WABASH EMPLOYMENT AGENCY
701 South State Street
Chicago 4, Illinois **WABASH—6020**
Specializes in placing all types of draftsmen, designers, engineers, technical men and executives.
Write for full information today.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

SELLING OPPORTUNITY WANTED

MANUFACTURERS' REPRESENTATIVE in Cleveland and Northern Ohio wants new lines. Twelve years' experience contacting tool shops, machine shops, and industry in general. RA-8237, American Machinist.

BUSINESS OPPORTUNITIES

For Sale, Job and Contract,

machine and welding shop. Excellent opportunity, going business showing good profit. Established 1911; modern equipment; located in growing Southeast, $25,000. BO-8358, American Machinist.

Mechanical Engineer

with shop, design and sales experience has $20,000 with services to invest in small going shop. BO-8372, American Machinist.

PATENT ATTORNEY

Patent Practice

before U.S. Patent Office, Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel, Registered Patent Attorneys. Suite 453, 815 15th Street, N.W., Washington 5, D. C.

PLANT SUPERINTENDENT WANTED

Manufacturing Plant in town employing 30 to 50 machinists and welders desires high type shop superintendent. Build heavy construction equipment. Our employes know of this advertisement.

P-8309, American Machinist
520 N. Michigan Ave., Chicago 11, Ill.

DISTRIBUTORS WANTED

• Largest French Twist Drill Manufacturer interested in setting up Distributors throughout the U. S. A. Drills made from American Steels.

SHEFFIELD TRADING CO., INC.
70 Pine St., New York 5, New York
WHitehall 3-0355

JOSEPH M. COOK AND STAFF

• • ***INDUSTRIAL ENGINEERS*** • •

Specialists in economical metal removal on machining operations.

May we discuss with you our approach to this problem?

1400 S. Penn Square • Philadelphia 2
Rittenhouse 6-5273

CONTRACT WORK

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them
GENERAL PATTERN WORKS
2233 Rack Street Cincinnati, Ohio

IF THERE IS
Anything you want
that other readers of this publication can supply

OR—

Something you don't want
that other readers can use advertise it in the
SEARCHLIGHT SECTION OF
American Machinist

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Telephone
BAKER 5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

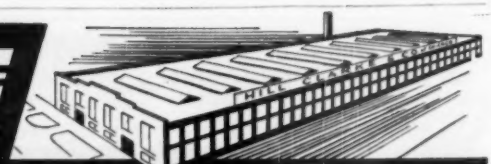
Every Item Guaranteed as Represented

AUTOMATIC, #8 B & S Auto. Cut-Off 11/16" Cap.
AUTOMATIC, 1½" Four Spdle. Cone. w/Thrd. Spdle.
AUTOMATIC, Nat-Acme #C, 5-Spdle. 9/16".
AUTOMATIC, B & S #2 Wire Feed. 1".
AUTOMATIC, B & S #2. 1".
AUTOMATIC, B & S #2G. 1".
AUTOMATIC, B & S #9G. ⅝".
BORING MILL, Niles B & P 120" Vert. 30 h.p.
BORING MILL, Colburn 72" Vert. Two heads.
BORING MILL, Colburn 60" Vert. Two Hds.
BORING MILL, Bullard 24" Vert. New Era Type.
BORING MILL, Gisholt 42" Vert. 220/440 volts.
BORING MILL, Lucas #31 Horiz. 3" Bar.
BORING MILL, Giddings & L #0 Horiz. 3" Bar.
BORING MILL, Giddings & L #32 Horiz. 3½" Bar.
BORING MILL, Ryerson #11 Horz. 5" Cap. #6 M.T.
BORING MILL, Barrett #2 Horiz. Cyl. Borer. 5"
BORING MILL, Betts 79" Vert. Turning & Boring. New in 1943. All Electricals.
BORING MILL, 61" Bullard MAXI-MILL. 2 Hds.
BORING MILL, #0 Giddings & Lewis, 3½" Bar. #5 M.T. 220/440 volts. TWO.
BORING MILL, Bullard 54" Vert. Spiral Drive.
Sommer & Adams #20A Boring, Hobbing & Threading Machine. Timken Bearings. Swings 30" over bed. 18" cross feed, 42" longit. Carriage has rapid approach & return. Used to mill internal threads. Excellent Condition.
BOREMATIC, Heald #49 Sgle. End. W/Univ. Fixture. 220/440 volts.
BROACH, Oilgear 10 Tons Horiz. 56" Str.
BROACH, LaPointe #3B. 25,000# 56 Str. 2-speed
BUFFER & POLISHER, U. S. Electrical Multi-Speed Double End #95, 5 h.p., 220 volts,
SGLE. SPDLE. DRILL, Fosdick 15" Sldg. Hd. #2
SGLE. SPDLE. DRILL, Barnes 24", #4 M.T.
SGLE. SPDLE. DRILL, Barnes 20", #3 M.T.
SGLE. SPDLE. DRILL, Buffalo #2MS. 20" #3 M.T.
SGLE. SPDLE. DRILL, Aurora 36" Bgrd. #5 M.T.
SGLE. SPDLE. DRILL, Colburn #2 Mfg. #4 M.T.
TWO SPDL. DRILL, Leland Gifford 20". #2 M.T.
TWO SPDLE. DRILL, Leland Gifford 29". #2 M.T.
TWO SPDLE. DRILL, Leland Gifford #2LMS 20". #2 M.T. 11" c.c.
TWO SPDLE. DRILL, Leland Gifford #2MS 20". #2 M.T. 11" c.c.
DRILL, Avey-Matic #3 Hvy. 2-Spdl. #3 M.T. 24".
3—SPDLE. DRILL, Leland Gifford #2 MS—14". 11"
3—SPDLE. DRILL, Edlund #2B. #2 M.T. 10". 9½"
DRILL, L. Gifford #2MS 14". 11" C.C. 3-Spdle
4—SPDLE. DRILL, Leland Gifford 20". #2 M.T. 11"
4—SPDLE. DRILL, Barnes #KT. #2 M.T. 24".
6—SPDLE. DRILL, Leland Gifford 14". #2 M.T.
DRILL, Cincinnati 21" Bgrd. Drilling & Tapping.
DRILL, Radial, Cinci-Bick. 5' Arm, 13" Col. #5 M.T. 24 speed gearbox. 7½ h.p. 3/60/220.
DRILL, Baker #314 Hvy. Pattern High Speed Vertical Boring & Drilling Machine, 7½ h.p. 220/440 motor, #5 taper, 12 feeds, 6 speeds, 12¼" thrust, 3" Capacity in steel.
DRILL, Leland Gifford #2LMS Upright Sliding Head Two Spindle, #2 tapr, 13" overhang, Independent 220 volts, 4-speed motors, indicated spindle speeds.
RADIAL DRILL, Fosdick 5' Arm, 14" Col. #5 M.T.
RADIAL DRILL, Mueller 3½' Arm, 11" Col. #4 M.T. 220/440 Volts.
RADIAL DRILL, Cinci-Bickford 4' Arm, 13" Col. #5 M.T. 220/440 volts.
RADIAL DRILL, Cinci-Bickford 6' Arm, 15" Col. #5 M.T. 220/440 volts.
RADIAL DRILL, Carlton 4'-18". Motor Dr.

PARTIAL LISTING OF LARGEST STOCK IN THIS AREA

DRILL, Natco #12 Multiple Spindle Motor Driven, #1 taper, 5 h.p. 220/440 motor. Arranged for 18 spindles, Rectangular head, With Natco 24" Rotary Table.
BASE PITCH & SPACE MEASURING MACHINE, #537 Illinois, Late Type—Like New, Capacity—12" diameter gear, 15" between centers, Full Set of Off-Set and Straight Contact Fingers, Dial Indicator, Tailstocks and Leatherette Cover.
SURFACE GRINDER, Horiz. #15 Covel 10½"x17½".
SURFACE GRINDER, Horiz. Leach 6"x12" Hand.
SURFACE GRINDER, Horiz. Thompson 18"x8" Hydraulic.
GRINDER, Cylindrical, Norton 10"x24" Hydraulic.
GRINDER, Cylindrical, Norton 6"x30" Hydraulic.
GRINDER, Cylindrical, B & Sharpe #4 Univ.
GRINDER, Cylindrical, B & Sharpe #10, 6x18.
GRINDER, Cylindrical, B & Sharpe #5, 3x12, Late.
GRINDER, Cylindrical, Cinci, 6x18 Hydraulic.
THREAD GRINDER, J & Lamson #TG-915 Automatic, Late Type
GRINDER, Blanchard #16, 20" Chuck Vert Rotary.
GRINDER, Landis Crank 10x32 Hydraulic.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.
GRINDER, Cincinnati #EA, 10" x 30" Hydraulic Cylindrical, Filmatic Bearings, 220 volts motors, Built-in electrics, Hydraulic infeed.
GRINDER, Norton 6 x 18 Hydraulic Vert. Rotary Auto. Exacto Spdle.
GRINDER, Norton 6 x 18 Hydraulic Horiz. Surface. Exacto Spdl.
GRINDER, Pratt Whitney 22" Vert. Rotary, 84" table travel.
GRINDER, Bath 10"x25" Motor Driven Universal Surface, 220/440 volts motor with centralized push button controls Internal Grinder Attachment & Steady Rest, etc
GRINDER, Greenfield #12 Internal Hydromatic. 220/440 V.
GRINDER, Heald #75 Internal.
GRINDER, Pratt Whitney 14x36 Vert. Rotary.
GRINDER, B & S #2 Univ. Cylindrical
GRINDER, Heald #22 Horiz. Rotary
GEAR HOBBER, B & S #34 Spur. 10" dia.
GEAR SHAPER, Fellows #7 High Speed.
KEYSEATER, Mitts & Merrill #5 Giant Motor Driven, 220/440 volts motor, Capacity—24" long, 3" wide keyway. Automatic Feed.
LATHE, LeBlond 36"x30". 220/440 motor, 12 speed head, taper attachment, steady rests, etc.
LATHE, 32"x16' Bridgeford G.C.G. Grd. Hd.
LATHE, American 27"x10' Grd. Hd. 12 speed. Taper attach. & chuck.
LATHE, 20"x18' Bridgeford G.C.G. Grd. Hd.
LATHE, Bridgeford 20"x14' G.C.G. 8'5" C.C. 220 volts two speed motor.
LATHE, 24"x8' Lodge Shipley, Hvy. Duty.
LATHE, 24"x14' LeBlond G.C.G. Grd. Hd.
LATHE, 20"x10' American G.C.G. 72" c.c.
LATHE, 20"x10' Hendey G.C.G. Taper Att.
LATHE, Reed-Prentice 20"x60" Grd. Hd.
LATHE, 20"x8' Lodge & Shipley G.C.G.
LATHE, 18"x8' Lodge Shipley G.C.G. Gr. Hd.
LATHE, Monarch 18"x40" Model #CBB.
LATHE, 16"x6' LeBlond G.C.G. Taper Attach.
LATHE, 16"x6' Lodge Shipley G.C.G. Grd. Hd.
LATHE, 14"x8' Hendey G.C.G. Taper Attach.
LATHE, 14"x6' Hendey G.C.G. Taper Attach.
LATHE, 12"x5' Hendey G.C.G. Taper Attach.
LATHE, 10"x24" Logan #820 G.C.G. NEW
LATHE, Hardinge #30 Hig hSpeed Second Operation machine, 1" Collet Cap Automatic Collet Mechanism, collets, collet chucks, etc., FOUR.
LATHES, Turret, Gisholt #5 Univ. Grd. hd. ram type.
LATHES, Turret, #1 Bardons & Oliver, ¾".
LATHES, Turret, #00 Oster Grd. Hd. 1½".
LATHES, Turret, #2B Simmons Grd. Hd. 1½".
LATHES, Turret, #2G Morey Grd. Hd. 1".
LATHES, Turret #4 W & S Univ. 1½".
LATHES, Turret, #3A W & S Univ. 3½".
LATHES, Turret, #2 Simmons Grd. Hd. 1".
TURRET LATHE—Gisholt #4 Univ. Grd. Hd.
TURRET LATHE, Bardons & Oliver #7 Universal Grd. Hd. Ram Type. Hydraulic Speed Selector, 2½" Cap. 10 H.P. 220/440 motor, With Chuck, toolholders, etc.
MILLING MACHINE, Vert. #3 Cinci. High Power.
MILLING Machines, Vert. #4 Cinci. High Power.
MILLING Machine, Horiz. #2, #3, #4, #5 High Power. 220/440 Motors.
MILLING Machine, Horiz. #2SP Van Norman.
MILLING Machine, Horiz. &2M Cincin. Univer.
MILLING Machine, Horiz. #3 Kempsmith Univer.
MILLING Machine, Horiz. #4 LeBlond Univ. Hvy.
MILLING Machine, Horiz. #1½ B & Sharpe Univ.
MILLING Machine, Horiz. #2 Kempsmith Univ.
MILLING Machine, Horiz. #2 B & Sharpe Univ.
MILLING Machine, Horiz. #3 B & Sharpe Univ.
MILLING Machine, Duplex, Cochrane-Bly #14 Univ. Mill & Shaper, 28 Taper, Shaper—0" to 8" Stroke. Rotary Table. 220-440 volts.
MILLING Machine, Duplex, Cincin. 24" Automatic.
MILLING Machine, Duplex, Van Norman #2.
MILLING Machine, Cincin. #4—36 Plain Hydmatic.
MILLING Machine, Cincin. #4—36 Duplx. Hydmtic.
MILLING Machine, Prod. #1—18 Cinci. Hor. Auto.
MILLING Machine, Prod. #0—6 Cinci. Vertical.
MILLING Machine, Prod. #0—6 Cinci. Auto. Horiz.
MILLING Machine, Production, #12 B&S 18" Late Type (6).
MILLING Machine, Prod. #12 B&S 24" Late Type.
MILLING Machine, Horiz. K&T #2B Dble. Overarm. 220/440.
MILLING Machine, Horiz. K&T #3B Dble. Overarm. 220/440.
MILLING Machine, Horiz. Atlas Bench Mill, Like new
MILLING Machine, Horiz. Nichols Hand Millers, late type.
MILLING MACHINE, Cincinnati Vertical #3 H.S. Dial Type. W/Rotary Table.
MILLING MACHINE, U. S. #MM1-8 Cam Controlled Automatic Horizontal, #40 taper, Late Type, 220/440 motors, TWO.
THREAD MILLER, Pine-O-Mill #5 Planetary Form & Thread Semi-Automatic Milling Machine. #40 Spdle. Timken Bearing. THY-MO-TROL Control Unit. 5 h.p.
PIPE THREADER, Williams #3, 1½" to 6".
BOLT THREADER, Hill-Acme #1½-C Sgle. Hd.
TAPPER & THREADER, W & S #11R Dual Radial. Motor and Tooling.
TAPER, W & S #1 Sgle. Spdle.
O.B.I. PRESS, Bliss #21D, 40 tons, 2½" Stroke.
POWER PRESS, Bliss #154 Open Back S.S.S.A. 65 tons, 4" Stroke.
POWER PRESS, Bliss #54 S.S.S.A. 18 tons, 10" Stroke, 20" between uprights.
POWER PRESS, Bliss #75½ S.S.S.A. 120 tons, 5½" Stroke, 24" between uprights.
POWER PRESS, Bliss #3A S.S. Dble. Crank S.A. Grd. 45 tons, 4" stroke, 36" between uprights.
WHEEL PRESS, Niles B & Pond 200 Tons Hydraulic Horizontal, 48" between strain bars, Two Plunger Type, 7.5 h.p. 220/440 motor.
POWER PRESS — Bliss - Consolidated #193 - B Straight Side Dble. Crank Single Action, 45 tons, 6" stroke, Bed area—36" x 41", 15 h.p. 220 motor.
SHAPER, Vert., Pratt Whitney #B—6" Motor Dr.
SHAPER—Columbia 32" S.S. Crank.
SHAPER—American 24" S.S. Crank.
SHEAR, Gap Squaring Niagara #91260, 10'x¼", Overdrives, 18" Gap, 20 h.p. motor, 220 V. spring hold-down and extra blades.
SHEAR, Morgan 120"x¼" Guillotine Plate, 30" Gap.
SHEAR, Quickwork #A-1 Rotary 60" Throat, 16 ga.
WELDER, Federal #712 AT Motor Driven Toggle Action Projection. New in 1936. 200 KVA, 10" throat, Stroke—1" to 3". With controls.
WELDER, Federal #624B Hvy. Duty Grd. Type 75 KVA. 1½" Stroke. 17" throat. Motor driven.

HILL-CLARKE MACHINERY COMPANY



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AUTOMATICS
No. 49 New Britain, 4 Spdl. Chucker

DRILLS
1, 2, 3, 4, 5, 6 Spdls Leland-Giff., Allen, Edlund, Avey's
No. 4BL Natco 36 Spdl. (1943)
No. C225 H Natco—20 Spdls. (1946)
No. 112 Defiance

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 615A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 72 Fellows Gear Shaper
No. 12 Gleason Bevel Gear Generator
No. 13 Brown & Sharpe Spur & Bevel
No. 1 Whiton Auto. Gear Cutter

BORING MACHINES
No. 31 Lucas 3" bar, M.D.
Rockford—3½" Bar
No. 2 Lambert 4" bar
No. 46-B Heald Bore-Matic (1942)
No. DB-112 Excello—Single End—2 Hds.
24" Bullard New Era
42" Bullard New Era
42" King
60" Colburn, M.D.
72" Niles-Bement-Pond
84" Betts, M.D.

GRINDERS
3"x12" Brown & Sharpe No. 5 (1944)
4"x12" & 4"x18" Landis, Model H (1942)
6"x18" & 6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
10"x72" Landis Type C Hydraulic
Norton Motorized Grinders ranging from 6"x18" to 24"x144"
No. 104 Rivett Univ. Gdr. (1943)
No. 5 Bryant Internal Grinder
No. 34 Abrasive Surface Grinder (1943)
No. 23—12" Heald Surf. Gdr.
No. 25-A Heald Surface Grinder
No. 72-A-3 Heald Internal (1942)
No. 72-A-5 Heald Internal (1942)
No. 74 Heald Internal (1942)
No. 16—36 Bryant Internal Gdr.
No. 24-26 Bryant Internal Gdr.
No. 81 Heald Centerless Internal

LATHES
18"x6' American, Gdr. Head, M.D.
17"x8' LeBlond, Cone Hd., M.D.
18"x8' American Gd. Hd.
24"-27"x22' Lodge & Shipley
36"x16" Betts—Bridgeford Grd. Head
10"x22" Sundstrand, Model AA (1943)
20" Fay Automatics (1942)
Model R-14 Seneca Falls Lo-Swing
No. 4 Gisholt Univ. Turret Lathe (1942)
No. 4R Libby (1942)
18" Libby, M.D.
No. 1A Warner & Swasey, Bar Fd.
No. 4F Fastermatic (1942)

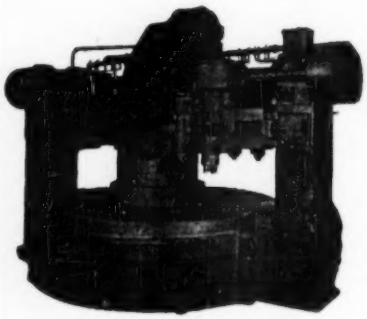
MILLING MACHINES
No. 3B Milwaukee Plain
No. 4 & No. 5 Cincinnati H.P. Plain
No. 3 Cincinnati Universal
No. 00 Cincinnati Vert.
No. 2½-B Milwaukee Vert.
No. 2 Cincinnati Dial Type Vertical (1941)
No. 3 Cincinnati H.P. Vertical
No. 0-B Cincinnati Pl. Mfg. Type
No. 1-18 Cincinnati Mfg. (1942)
No. 2—18" Sundstrand-Electromil (1942)
No. 2—24" Sundstrand Electromil (1942)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 45-48 Cin. Hyd. Tracer (1941)
6"x36" Lees-Bradner—Model LT (1943)
12"x54" H.T. Lees-Bradner Thread Miller (1943)
10"x48" Hanson-Whitney Thread (1942)
48"x24"x12' Ingersoll Slab Miller
36"x24"x12' Ingersoll Duplex Miller (1946)
No. 10 Ingersoll 72"x6' Travelling Col. Face Millers (1942)
No. 36—120 Cincinnati Horizontal Hydrotel

MISCELLANEOUS
36" Ohio Shaper
18" Dill Slotter
No. 8 Armstrong Band Saw
10"x10" Rassmussen Saw, Stock Fd.
4" Toledo Pipe Machine (1944)
Micromatic Vertical & Horizontal Hydrohoners

PLANERS
36"x36"x12' Cincinnati
36"x36"x12' Gray, 2 Hds.
36"x36"x18' Gray Maxi Service, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500

Newton Type V-4 Continuous Rotary Milling Machine



Equipped with 2 double heads, and 2 single heads, diameter spindle sleeves 6⅝" complete with 25 H.P. motor.

An ideal machine for continuous production of cylinder blocks, bases and a multitude of similar parts.

EMERMAN MACHINERY CORP.
875 W. 120th STREET CHICAGO 43, ILL.

UNUSUAL VALUES

Milling Machines—No. 1 Universal, No. 1 American (new, plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 16"x36" Surface 12"x63", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—10"x6', 3', 10'—18"x6', 8' 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized. Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24" B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24" Hi Duty 2" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88 Columbus 16, Ohio

BEAVER-BILT*
Brown & Sharpe Automatic Screw Machines
Guaranteed to Operate the Same as New

THE FOLLOWING LATE TYPE, HIGH SPEED BROWN & SHARPE AUTOMATIC SCREW MACHINES ARE NOW IN STOCK FOR IMMEDIATE DELIVERY AT A FRACTION OF ORIGINAL COST.

3—No. 0G H.S. Serial Nos. 9434 (1940); 10349 (1943); 11841 (1944), Swing Stop, ¾" Spindle Cap., 4150 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.
2—No. 2G H.S. Serial Nos. 8519 and 6775 (1940), Swing Stop, Vertical Cutoff Slide, 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.
1—No. 2G H.S. Serial No. 10811 (1943), Swing Stop, Vertical Cutoff Slide, 1½" Spindle Cap., 2100 Spindle Speed, Motor in base. Beaver-Bilt.

Each of the above machines is Beaver-Bilt and complete with the following standard equipment—Standard Capacity Feed Tube—Front and Back Circular Tool Posts—Work Pan—Wrench Rack—Turret Hand Lever—Full set of Feed Change Gears—Full set of Spindle Speed Change Gears—Stock Stands—Complete set of Oil Splash Guards.

TRADE-IN SPECIALS IN GOOD OPERATING CONDITION

4—No. 00 Standard B. & S. Automatic Screw Machines Serial Nos. 6460, 7268, 7821, and 8062 complete with countershafts and standard equipment. Very clean machines.
1—No. 00G Standard B. & S. Automatic Screw Machine Serial No. 11,391 with motor in base and standard equipment. Very good condition.
2—No. 0 Standard B. & S. Automatic Screw Machines Serial Nos. 5263 and 5525 complete with standard equipment. Fair condition.
1—No. 0G Standard B. & S. Automatic Screw Machine Serial No. 4569 with motor drive and Screw Slotting Attachment, also standard equipment. Very good condition.
1—No. 2G Standard B. & S. Automatic Screw Machine Serial No. 4310 with Geared Head and Single Pulley Drive. Fair condition.
1—No. 2G Standard B. & S. Automatic Turret Forming Screw Machine Serial No. 2402 with Geared Head and Single Pulley Drive. Very good condition.
1—No. 2 Standard B. & S. Automatic Turret Forming Screw Machine Serial No. 2862 complete with Countershaft and standard equipment.
2—No. 2 Standard B. & S. Automatic Screw Machines Serial Nos. 437 and 3174 complete with standard equipment. Fair condition.

OTHER FINE MACHINE TOOLS

6— Elgin Precision Bench Lathes, 7" x 15" Capacity, complete with 4" Diameter Three Jaw Universal Chucks, Dog Plate, Face Plate, Draw Bar, Compound, Tail Stock, Grinding Attachments, 6 Foot Heavy Maple Benches, and Motor Drives with Motors. New 1945 and in excellent condition.
6— Hardinge Second Operation and Hand Screw Machines, Bench Type, with Collet Type Headstocks and Six Hole Turret Index Type Tail Stocks. New 1945. Excellent condition.
1— Vertical Cutoff Slide Attachment, complete, for No. 2G High Speed B. & S. Automatic Screw Machine. New never used.
1— Screw Slotting Attachment, complete, Belt Drive, for No. 0 High Speed B. & S. Automatic Screw Machine. New never used.
1— Turret Drilling Attachment, Motor Driven, for No. 0G High Speed B. & S. Automatic Screw Machine. In excellent condition.

*Not Just RE-Built — But BEAVER-BILT!

1. Beaver-Bilt Machines are *unconditionally guaranteed* to produce work to the same tolerances as a new machine of the same type.
2. Only genuine Brown & Sharpe replacement parts are used on Beaver-Bilt machines and no change is made from standard.
3. Beaver-Bilt Brown & Sharpe machines save you up to 50% of the cost of a new machine of the same type.
4. Each machine is properly skidded, crated, and loaded on a truck free of charge.

HERE'S THE BEAVER UNCONDITIONAL GUARANTEE

Any Beaver-Bilt or "as is" machine sold by us can be operated in your own shop for a period of 30 days and, if found unsatisfactory for *any reason whatsoever*, may be returned freight prepaid for a full refund of the purchase price.

We have specialized exclusively in the rebuilding and servicing of Brown & Sharpe Automatic Screw Machines for 15 years. You profit by this valuable experience.

PHONE: SEEley 3-0680

Beaver Industries

1510 WEST ADAMS STREET, CHICAGO 7, ILLINOIS

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY

RADIAL DRILLS

3'-9" Cincinnati-Bickford, gear box on base
3'-9" Mueller, gear box on base
3' American Sensitive, cone
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, 13" col., gear box
5'-13" Cincinnati-Bickford, m.d.
5' Cincinnati-Bickford Full Universal, gear box
5' Cincinnati-Bickford Plate Hole Driller, m.d. on arm
5' Prentice, m.d., Plain
6'-15" Carlton, gear box, inclosed head
6'-15" Cincinnati-Bickford, with 7' arm, m.d.
6' Niles-Bement-Pond Semi-Universal, m.d.
6'-16" Western, m.d.
6'-17" American Triple Purpose, m.d. on base
7'-17" Dreses, gear box, m.d.
8'-16" American Triple Purpose, m.d. on arm

UPRIGHT DRILLS

No. 1 Minster H.-Duty, m.d.
20" Barnes All Geared, m.d., tapper
20" Cincinnati, belt drive
21" Cincinnati, belted m.d.
30" Rich H.D., m.d.
32" Aurora, belt drive
No. 25 Foote-Burt, m.d.
No. 36HO Baker H.D., m.d.
D4 Colburn H.D., m.d.
D8 Colburn H.D., m.d.
No. 217 Baker H.D., s.p.d.
8225H Natco H.D., m.d.

GEAR SHAPERS

No. 6 Fellows, belt drive
No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61 Fellows, belted m.d.
No. 61A Fellows, m.d., latest type
No. 64S Fellows, m.d.
No. 613A Fellows, m.d., late type
No. 64A Fellows, m.d., latest
No. 645 Fellows, m.d., latest
No. 645 Fellows, belt
No. 72 Fellows, m.d., latest
No. 75 Fellows, m.d.

GEAR GRINDERS

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical, m.d.
No. 2HS Lees-Bradner Spur & Helical, m.d.
No. 13LS Fellows Gear Lapper, m.d.

GEAR HOBBING MACHINES

Type A Barber-Colman, m.d.
Type S Barber-Colman, m.d.
No. 12 Barber-Colman, single overarm, m.d.
No. 12 Barber-Colman, double overarm, m.d.
No. 12H Gould & Eberhardt Universal, m.d.
No. 34 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe, Spur & Spiral, m.d.

GEAR CUTTERS

No. 4-48" Brown & Sharpe Automatic Spur Gear Cutter, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.
3" Gleason Straight Bevel, m.d.
8" Gleason Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
Cross Gear Tooth Rounder, m.d., 9" cap.
National Broach & Machine Co. Red Ring Gear Speeder, 10" cap.

GEAR TESTERS

Gleason Gear Tester for hypoid gears
No. 1 Brown & Sharpe Spur Gear Tester
No. 4 Gleason Angular Hand Rolling Tester, m.d.
12" cap. National Broach & Machine Co. Red Ring Gear Checker
18" National Broach & Machine Co. Red Ring Universal Gear Tester

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d
Cincinnati Valve Seat Grinder, cap. 3/8" valve stems, m.d.

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 11-18" spindles
No. 55 Heald, m.d., 15-24" spindles
No. 73 Heald Airplane Cylinder Grinder, m.d., brand new, late type

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241 — CABLE ADDRESS EMCO

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

No. 49 New Britain Chucker. 1941.
20"x25" Fay Automatic. 1943.
No. 12"x21" Fay Automatic. 1942.

BORING MACHINES

No. 48 Heald Single End. 1943.

DRILLS

No. 26HO Baker. 1942.

GEAR EQUIPMENT

No. 6 Gleason Revacycle. 1941.
No. 6 Gleason Testers. 1943.
6" Red Ring Internal Shaver. Late.
No. GCL-3 Red Ring Shaver. 1942.
No. 04SA3 & 61A Fellows Gear Shaper. 1942.
No. 72 Fellows Shaper. 1943.
Red Ring Univ. Checker.

GRINDERS, CYLINDRICAL

18"x36" Cincinnati Plain. 1942.
14"x36" Landis Plain. 1943.
12"x30" Landis Univ. 1941.
10"x18" Norton Plain. 1942.
6"x30" Landis Plain. 1942.

GRINDERS, SURFACE

30"x24"x192" Mattison. 1943.
14"x36" Pratt & Whitney. 1943.
8"x24" Thompson Hyd. 1942.

GRINDERS, INTERNAL

No. 24-36 Bryant Hyd. 1945.
No. 172 Heald Gap. 1940.
No. 72A3 & A5 Heald Rotary. 1943.
No. 73 Heald Hydraulic. 1942.

GRINDERS, THREAD

No. 33L Excello. 1943.

LATHES, ENGINE

18"x120" Lehmann, G.H.
16"x54" Reed-Prentice. 1942.

LATHES, PRODUCTION

No. 3 FU Foster "Fastermatic". 1942.
No. 3A L&B "Duomatic." 1943.
8"x108" La-Swing Semi. Auto. 1942.
14"x42" Monarch "Magna-Matic." 1941.

LATHES, TURRET

No. 1L Gisholt. 1943.
8½"x24" Acme Univ. 1943.
No. 5.9 Acme Univ. 1942.
No. 3R Gisholt. 1943.
No. 1H-5 Libby. Late.
No. 6R Denver. 1942.
No. 3 Bardons & Oliver.

MILLS, PRODUCTION

No. 34-36 Cincinnati. 1942.
No. 1-18 & 2-24 Cincinnati. 1942.
No. 1-14 Kent Owens. 1942.
No. 12 Brown & Sharpe. 1942.

MILLS, THREAD

6"x30" Lees Bradner. 1942.

MILLS, UNIVERSAL

No. 3 Cincinnati, D.T. 1943.
No. 2MH Cincinnati. 1942.

MILLS, VERTICAL

No. 4H Milwaukee. 1942.
No. 8½ D Gorton. Late.

PRESSES

300 Ton Lake Erie, Hyd. 1943.
50 Ton Denison, Hyd., Str. 1942.
56 Ton Niagara O.B.I. Late.

SHAPERS

20" Cincinnati Plain. Late.
6" Pratt & Whitney. 1942.

WELDERS

150 KVA Federal Seam. 1943.
60 KVA Selsky Spot. New.

Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. . . Indianapolis, Indiana

SPECIAL OFFERINGS

USED MACHINES FOR IMMEDIATE DELIVERY

#70A HEALD Internal Grinder, Univ. ..... $ 905
#4B BROWN AND SHARPE Plain Horiz. Milling Machine 1150
#4 CINCINNATI Vert. Milling Machine 1150
#9 BROWN AND SHARPE Auto. Screw Machine 750
42" x 16 ga NIAGARA Power Shear, underdrive 575
3G LITTELL Winder Reels (6) ..... ea 175
12"x35" SEBASTIAN Geared Head Lathes (3) ..... ea 1275
WATERBURY FARRELL Bullet Presses, 20 ton, 8" stroke. (2) ..... ea 1150
#2 CINCINNATI ACME Univ. Turret Lathe 1150
K-5 WARDWELL Auto. Bandsaw Filler & Setter 175
HC WARDWELL Auto. Band & Hacksaw Grinder 375
30" ROGERS Vertical Turret Lathe 1150
50 ton WILLIAMS AND WHITE Vert. Hyd. Press, 4 post 6250
DB-112C EXCELLO Boring Machine 4050
#10 BLANCHARD Rotary Surface Grinder 4150
J & L HARTNESS Turret Lathe, chucker 500
150 Amp. GENERAL ELECTRIC Arc Welder, MG, port. 225
400 Amp. WILSON HORNET Arc Welder, MG, port. 295
#2BC GARVIN Automatic Tapper 195
#1 GARVIN Automatic Tapper 150
12B PRATT & WHITNEY Vert. Miller & Profiler, 2 spdl
50 KVA TAYLOR & WINFIELD Semiml Horiz Seam 105MM Shell Welder (3)

NEW MACHINES TOOLS ON ORDER IMMEDIATE OR EARLY DELIVERY

12"x40" SHELDON Lathe, pedestal base
11"x30" SHELDON Lathe, metal cabinet base
#35G JOHNSON OBI Punch Press, 80 ton, 6" stroke
#3 JOHNSON OBI Punch Press, 27 ton, 4" stroke
#18D BUFFALO Drill Press, floor type, #3MT.
#15 BUFFALO Drill Press, floor type, #2MT.
NB-18 GROB Metal Profile Band Saw, 18" throat
30 KVA REX Spot Welder, air operated, press type
15 KVA REX Spot Welder, foot operated, rocker arm type
#1 JOHNSON Metal Cutoff Band Saw, 10"x18" cap.
12 ton WIANT Hydraulic Arbor Press

TRI-STATE PRODUCTS COMPANY
19—17th St., Toledo 2, O., Ma. 6229

IMMEDIATE DELIVERY — MONEY BACK GUARANTEES

AUTOMATICS
Cone 4 Sp. 1½" Autos.
Fay Automatic, 12"x81".
Lodge & Shipley Duomatic 2A

BORING MILLS
Giddings & Lewis No. 0, No. 25T.
Lucas No. 31, horiz.
Stoker Unit Simplex Double end
Bullard 24", 36", 42" VTL
King 72", 42" vertical

DRILLS AND RADIALS
Carlton 8'-19" column
Canedy-Otto 3'-8" col.
Defiance 112—21" No. 4MT
Fosdick No. 5BM
Sibley 24"-28", Power Feeds
Hamilton, Langelier, Hi-Speed.

ENGRAVERS
Gorton No. 2Z
Deckel, 2 dimen. G1L
Gorton Cutter Grinders 375-2, 265-6.

GEAR EQUIPMENT
Fellows #7, 72, 712, 725, High Speed
Fellows 645Y Spur & Spiral
Gleason #2 Surface Hardener
Gleason 3" Str. Bevel Generator

GRINDERS, MISCELLANEOUS
Brown & Sharpe #5 cyl. 3"x18"
B. & S. Nos. 1, 3 Univ.
B. & S. No .13 Univ. & Tool.
Bryant #16 Internal
Cin. 12x48", Univ.
Covel No. 91A Univ. T. & C.
Dalzen Thread, latest
Gardner #226, 30" Disc.
Hanchett #228 Disc. Dbl. opposed w. M.D. Feed.
Heald 72A3 Sizematic Int. Centerless
K.O. Lee Tool & Cutter.
Landis, 10x24" Type C Univ., 10x36" Univ.
Norton No. 2 Tool & Cutter, Hyd.
Oliver 510 Drill Grinder, Sellers 6G, 4G Drill Grinder
Wickman Profile

GRINDERS, SURFACE
Abrasive No. 33, 24 Vert. 8x24.
Arter Rotary 12" chuck
Blanchard No. 11, 16" Mag. Chuck.
Brown & Sharpe #5, 8x24"
G & L Hyd. #25, 6x18", #45, 12x24".
Heald No. 22 Rotary 14" chuck
Norton 6x18", and 10x36" Hyd.
Reid No. 2A P.F. MIB.
Thompson Hyd. 6 x 10 x 18", 6 x 12 x 18"

MILLS, PRODUCTION
Brown & Sharpe, No. 000, 12, 21
Kent Owens IV
U. S. Multimiller, 1 & 2 Spindles
Sundstrand 00 Rigidmills

HYDRAULIC PRESSES
DOWN MOVING RAM, SELF CONTAINED

MANUFACTURER	TON CAP.	STR.	OPENING	PLATEN
Lake Erie	500	36"	36"	35 x 36
Watson Stillman Shaft Straightener	500	24"	57"	24" bed
Denison	25/50	18"	23"	22 x 20
Hanniffa	50	20"	30"	22 x 20
Southwark, D. A. Clamping Plate	125	30"	2' to 4'	84 x 30
Oilgear Shaft Straightener	35	8"	12"	84 x 11

DOWN MOVING RAM, WITHOUT POWER UNIT

Mesta	750	42"	80"	44 x 44
Chambersburg	300	10"	27"	22 x 36
Southwark	350	42"	78"	28 x 48
Southwark	550	23"	48½"	42 x 32

UP MOVING RAM PRESSES

Waterbury Farrel	800	6½"	28"	22 x 24
Watson Stillman	300	12"	31"	24 x 30
Watson Stillman	300	12"	19"	30 x 20
HPM	180	15"	14½"	30 x 30
Stokes Molding Press & Pump	50	7"	25"	20 x 12
Elmes—With Elec. Plates	50	6"	12"	18 x 18
Stewart Boling	85	10"	19"	20 x 20

WHEEL PRESSES
NILES — 600 ton 96"
500 ton — 48"; 300 ton — 48.

INJECTION MOLDERS

ACCUMULATORS

Mfr.	Size	Pounds
HPM	4" x 9"	2000
General Electric	15" x 11"	400
Watson Stillman (13 gal) Hydr. Pneu.	42 x 9 x 48"	3000

LATHES
Hendy 12"x30" Taper Attachment G.H.
Lodge & Shipley 14"x30" 23 speed G.H.
Lodge & Shipley, 20"x54" 24 Speed G.H.
Rivett 608 QCG, TA, Precision
South Bend Q.C.G. 18"x6', 19"x4'

MILLS, PLAIN AND UNIVERSAL
Cincinnati #2 Plain Hi-Speed Dial Type
Cincinnati No. 3 Plain, 2M Plain
Cincinnati No. 4 Univ. Hi-Power
Cincinnati No. 1M Universal
Milwaukee 2HL, 2H Univ., H.S.
Milwaukee #2K High Speed Dial Type
Van Norman Duplex, 12, 20

MILLS, VERTICAL
Cincinnati No. 4, Hi-Power
Gorton No. 8½D Duplicator
Morey No. 12M Profiler 2 sp.
Pratt & Whitney #2 Jig Borer
Vernon Tool Room Model

PRESSES
Bliss No. 18, 19, 20, 21, OBI.
Bliss No. 304A, 4" Str. 28"x24" bed, S.S.
Bliss No. 650 Hi-Production, 58, 62, 162
Bliss No. 4½ Double Action Cam
Colton Tablet Presses.
Gen. Flexible Screw Press.
Stokes Tablet Presses, Model R & T, DD2.
V&O #01

TURRET LATHES
Acme No. 6 W Bar and Chuck, Acme Fox.
Bardons & Oliver No. 3, 1½" cap., No. 5 Chuck.
Brown & Sharpe 2F
Foster No. 3B.
Gisholt No. 4, Bar and Chuck, 21, Saddle Type Cross Sliding Turret

MISCELLANEOUS
Band Saw: DoAll 36" Zephyr, Tannewitz No. 36M, Marvel No. 8
Centering Machine: Sundstrand.
Die Casting Machine DCMT
Hacksaw: Marvel Nos. 6 and 6A, 9A, 10" x 10"
Marking Machine: Noble & Westbrook
Notching Press: Ferracute C82.
Pin Machine: Nilson.
Profilers: Morey 12M
Shaper: Cinn. 24" Universal. Sheldon 12" Brand New.
Rotary Shear: Quickwork 5/16" Cap. 36" throat circle cutting attach.
Honer: Micromatic Hydrohoner.
Keyseaters: Mitts & Merrill, Baker, Davis.
Lappers: Ultralap.
Rivet Hammers: Hi Speed.
Shear: 10' x 16 Ga. Niagara
Toolmakers Microscope: Gaertner, Bausch & Lomb, Leitz

WRITE FOR FREE CATALOG

AARON MACHINERY CO., Inc.

45 Crosby Street, New York 12, N. Y.
WOrth 4-8233 Cable: AARMACH, N. Y.

FOR SALE

1—Niles Bement Pond Wheel Press—600 ton heavy duty for locomotive wheels

1—Betts boring mill — 90" 2 speeds. Size of table 84"—Feeds to head

1—Ingersoll Rand Compressor 480CFM—Imperial Type XB —RH 41820PP—16x14—LH 41819 PP—10x14—100 et. pressure

1—Caldwell wheel press—300 ton horizontal

2—Niles Bement Pond Wheel lathes—double head—swing over ways 92" diameter of face plate 90"

1—Putnam wheel lathe—rebuilt —heavy duty 42"x18" quick change actually 43½x8' between centers

First-Class condition — Prompt shipment — Subject to prior sale

Write or Wire Collect for Details

FRANK M. JUDGE & COMPANY, INC.

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HEADLINERS

GEAR MACHINERY

No. 18-H Gould & Eberhardt Hobber, MD
No. 34 Brown & Sharpe Hobber, MD
32"x16" Cincinnati Hobber, MD
No. 1 Adams Hobber, arr MD
12"x18" Gleason Str. Bevel Gear Generators
No. 4-36 & No. 6-60" Brown & Sharpe Cutters
No. 4 Cincinnati Gear Cutter
No. 13 Brown & Sharpe Spur & Bevel Gear Cutter

GRINDERS

No. 2 Cincinnati Centerless, MD
No. 2 Diamond Surface
No. 3 Abrasive Surface
10"x18" Norton Type C Plain Cylindrical, new 1943
TG-636 Jones & Lamson Thread Grinder, 1943

BORING MILLS

36" Bullard "New Era" Vert. Turret Lathe
36" Rogers IT-36 Vert. Turret Lathe, new 1941
48" Gisholt, Vert., 2 heads
No. 21 Lucas Horz., 2¾" bar
No. 3A Universal Horz., 3" bar

LATHES

14"x30" ctrs Lodge & Shipley Selec. Grd. Hd., MD
14"x56" ctrs LeBlond Gap, MD
16"x32" ctrs Sidney Grd. Hd., arr MD
17"x50" LeBlond, MD
20"x96" ctrs American Grd. Hd., MD
24"x72" ctrs Bridgeford, MD
30"x127" ctrs Lodge & Shipley, cone
36"x270" ctrs Lodge & Shipley Trip. Grd. Selec. Hd., MD, two carriages, taper

MILLERS

No. 2 Cincinnati Universal, cone
No. 2 Brown & Sharpe Heavy Plain, arr MD
No. 3B Milwaukee Universal, SPD
No. 3 Cincinnati High Power Plain, MD
No. 4 Cincinnati High Power Univ., MD
No. 4 Cincinnati High Power Vert.
No. 4 Ohio Plain, MD

PLANERS

28"x28"x6' Cincinnati, MD
30"x30"x18' Whitcomb, MD, 2 hds.
36"x36"x16' Gray, MD, 4 hds.
36"x36"x18' Gray, BD, 2 hds.
42"x42"x10' Niles-Bement-Pond, BD, 3 hds.
42"x42"x14' Niles-Bement-Pond, DC var. speed MD, 4 hds.
72"x60"x14' Cleveland Openside, DC rev. MD with MG set

MISCELLANEOUS

400-ton Niles-Bement-Pond Wheel Press, MD
2⅝" Cone 4-spindle Automatic, MD
No. 6A Marvel Hack Saw, automatic feed, 1943
No. 5 Baker Keyseater
10" Pratt & Whitney Vert. Shaper
No. 9-SP-BS Buffalo All-Steel Bar Shear, new 1941
Jackson Die Sinker, cherrying attach.

SEND US YOUR INQUIRIES

COX MACHINERY CO., INC.
P. O. Box 1953 CINCINNATI 1, OHIO
OFFICE AND WAREHOUSE: 311-313 Bakewell St. Covington, Kentucky
Three minutes from the Cincinnati hotel district

LATHE—Engine, Mackintosh-Hemphill, 72"/110"x30' Centers (1943)
VERT. MILL—Cinc. Hydrotel #28/60, 4-spindles, Tracer (1942)
CRANE—150 Ton x 30' span, Whiting, Bridge, plus 2 Aux. Hooks 25 ton
CRANE—Shepherd 3 Ton x 30' Span Floor Control.

BORING MILLS—D & H 3½" horiz. floor
Vertical Turret Lathe, 30'
Bullard 72", 2 swivel heads on rail (old)

CRANE—Overhead, 3 Ton x 30', floor control

DRILL PRESSES—Minster #2D, 2½" cap. Hvy.
Snyder, 1½", 28" swing

GEAR SHAPERS (2)—Fellows #6

FURNACE CONVEYOR—72"x24"x34' Electric & gas at 900° F.

GRINDER—Surface, Reid Model 2-1 (late)

INDUCTION HEATER—Lapel 7½ KW

LATHES—Engine, Logan 10"x4' cabinet
Turret, Simmons #2B—Bar 1¼"
Turret, Oster #601—1½" cap.
Turret, Foster #1B Universal, Chucker
Turret, Midland #5 Air Chucker (late)

MILLERS—Newton Vert. 42" Rotary Hvy.
Cinc. #3 Vert. Hi Power
Br. & Sh. #3 Universal
Cinc. #08 Vert. (late)

PUNCH—Sg. end, Smith 1-1/16" thru ⅝"

ROLLS, Angle—Bertsch 3"x3"x¾"

ROLLS, Bending—H. & J. 30'x¾", Pyr.
Southwark 15'x3", Vert.

SHEARS—Square—Famco Power 36"x18g (new)
Alligator—(#2) 24" blade, 3" Rds.
Rotary—Quickwork #50A, 48"x¾" (late)

SPOT WELDER—75 KVA Federal

THREAD MILLS—Morey 12"x10' Centers (late)
Lees-Bradner 9"x36" centers

THREADER—Bolt—Acme 2½" cap.

PRESSES—Z & H #7, 50 ton percussion
Bliss #78½, 450 ton, 18" stroke
W. F. #104A Horiz., 50 ton, shell drawing

KINGS COUNTY MACHINERY EXCHANGE

408 Atlantic Avenue **Brooklyn 17, N. Y.**
TRiangle 5-5237 Dept. "A"

REMEMBER
THIS TRADE MARK

It's your assurance of quality machine tools backed up by three generations of machine tool experience. Every Goldman machine tool is fully guaranteed to give complete satisfaction.

SELECTED MACHINERY
for immediate delivery

- AUTOMATICS
- BROACHES
- DRILLS
- GRINDERS
- JIG BORERS
- LATHES
- MILLING MACH
- PRESSES
- PLANERS
- SHAPERS
- MISCELLANEOUS

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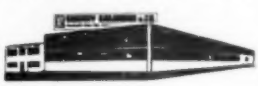

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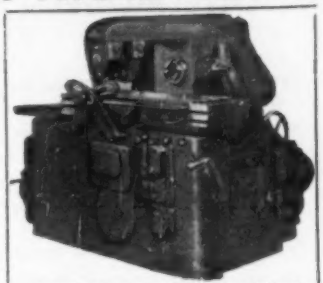
HARVEY GOLDMAN & COMPANY

3900 SCHAEFER HIGHWAY • DEARBORN, MICH.
TELEPHONE: TIFFANY 6-4450

LATEST TYPE MACHINE TOOLS

BORING MILLS—Horizontal
NILES-BEMENT-POND 5", 6" bar, Floor Type, M.D.
NILES 5" Bar Table Type, latest type
BORING MILLS—Vertical
BULLARD 24", 36", 42" N.E. Ver. Turret Lathe, M.D.
BULLARD 16", 8" 6 spdle. mult-au-matic, M.D.
KING 52"; 2 swivel hds; P.R.T.; M.D.
KING 62"; 2 swivel heads, side head, latest
NILES 100", 8 swivel heads, Rapid Traverse, AC M.D.
DRILLS—Miscellaneous
BARNES H-8 "Hydram" Hydraulic, 3" capacity—for inverted drilling, Latest Type
NATCO #6AL Multiple, 30 spindles, Hyd. Latest Type
GEAR CUTTING EQUIPMENT
BILGRAM 6" and 16" cap., Bevel Gear Gen., M.D.
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
FELLOWS Model 6I, 6IA, 6S2, 7A, 7I5, 7I25, 7S, 725, 77 High Speed Gear, Shaper, Latest Type
GLEASON #14 Hypoid Spiral Gear Grinder, Latest Type
GLEASON 5", 12" straight bevel generator, latest type
GLEASON 24", 37", 77", 95" Straight and Bevel Gear Planer, Motor drive
GLEASON #26 hypoid generator—latest type
GOULD & EBERHARDT 12M Hobber, 0-18"F., Latest
GOULD & EBERHARDT 18M Hobber, Motor Drive
GOULD & EBERHARDT 96H Hobber, with diff. M.D.
NEWARK #5, 72" Hobber with Infeed and Diff. M.D.
PRATT & WHITNEY 16" Grinder, hyd., latest
GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
CINCINNATI 16"x36" Model ER, Univ., Latest Type
LANDIS 4x12, Type H, Plain Hyd., Latest Type
LANDIS 14"x18" Type C Plain, Hyd., Latest Type
LANDIS 14"x18", type C Univ.—latest type
LANDIS 29"x130" Plain Roll, Motor Drive
NORTON 10"x72" Type C, Plain, Latest Type
NORTON 17"x72" Crankpin Grinder, Hyd., Latest
GRINDERS—Miscellaneous
BRYANT #3, #6, 16-C-16, 16-CP-16, 24-36" Internal, Hydraulic, Latest Type
HEALD 72A5, Hydraulic, Internal, latest type
LA POINTE 60" Universal Broach Sharpener, Latest
VAN NORMAN #639, Osc. Radius Grinder, Latest
VAN NORMAN #606 Crankshaft ReGrinder, Latest
GRINDERS—SURFACE
ABRASIVE #34 Vert.—8x24"; Latest
BLANCHARD 18A Vertical, Disi Feed, Motor Drive
HEALD #33 Rotary, 12" chuck, latest type
PRATT & WHITNEY 14x36" type B; vert., Latest



CINCINNATI 4-36 Plain Hydromatic Miller Machine, TIMKEN bearing—hydr.—rest. overarm M.D.

JIG BORERS
R.KEARNEY & TRECKER Model B Autometric, Latest
SOCIETE GENEVOISE (SIPP) #4 Precision, Table 18"x37", Motor Drive
LATHES—Engine and Mfg.
AMERICAN 36"x360 centers, 2 carriages, motor drive
JONES & LAMSON "FAT" 30x35", Automatic, latest
JONES & LAMSON "FAT" 24"x36" Automatic, Latest
LeBLOND 4x60, 4x84, 8x60, 8x168, 8x24, Latest
MONARCH 32"x336" Centers 3 Carriages, Timken Bearing, Model CM, Motor Drive
NILES 26"x36" Boring "Time Saver" Timken, Latest
LATHES—Turret
GISHOLT #1L, #3L, Universal, Timken, Latest
MOREY No. 2G, No. 3, No. 4 Timken Bearing, latest
POTTER & JOHNSTON #5UR, Timken, Latest
WARNER & SWASEY 2A Universal, M.D.
MILLING MACHINES—Mfg.
INGERSOLL 42"x42"x16' planer type adj. rail; 4 heads; latest type
INGERSOLL 42"x36"x12' adj. rail, 4 heads, AC, M.D.
INGERSOLL 32x24x16' Planer Type 2 heads, AC, M.D.
INGERSOLL 30x24x12' adj. rail slab, M.D.
SUNDSTRAND Model 3A Duplex 42" feed, Latest
TAYLOR & PENN M60 Duplex Spline, latest
MILLING MACHINES—Plain
BROWN & SHARPE #2B Timken, Latest Type
CINCINNATI 0-3, 2-16 Automatic, Latest Type
CINCINNATI #3, #4, #5 High Power, Late Type
CINCINNATI 4-36, 24-36 hydr. Simplex; Latest
KEARNEY & TRECKER 1604, Simplex, Latest
MILLING MACHINES—Thread
LEES BRADNER 12"x54" Model H.T.—Latest type
MOREY 12x30", 60", 120", 180" centers, Latest Type
PRATT & WHITNEY 6x60" Model C, Latest Type
PRATT & WHITNEY 4½"x12" Model C, Latest Type
PLANERS
BETTS (CONSOLIDATED) 84"x87"x16' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
BETTS (CONSOLIDATED) 108"x84"x36' 4 heads, Box Table, Rapid Traverse, D.C., M.D., Late Type
CLEVELAND 48"x48"x18' Openside, Motor Drive
LIBERTY 144"x96"x48' Openside Convertible
LIBERTY 48"x48"x16' 4 hds. VARI-VOLTAGE drive —latest type
LIBERTY 72"x48"x20' 4 hds. Convertible, openside, VARI-VOLTAGE drive, Latest Type
SELLERS 60"x60"x12' 4 hds. VARI-VOLTAGE drive, P.R.T.—Latest Type
NILES 72"x72"x30' 6 hds. P.R.T. VARI-VOLTAGE; M.D.
PRESSES
BIRDSBORO 325 ton, vert, hyd., Latest Type
CLEARING K-1500-30 Knuckle Joint, 500 ton, 4" stroke, Latest Type
GLEASON 19", 36" Quenching, Motor Drive
LAKE ERIE 800 ton Vert. Hyd., Latest Type
MISCELLANEOUS
ACME 2" forging, upsetting; latest type
BARNES #5 Keyseater Motor Drive
BARNES #17L, 20GH, 28T, Vertical Hone, Hyd., Self Oiling, Latest Type
FOSTER 4"x18", 4"x36" Superfinisher, Latest
HELLER Model 8S-1 Cold Saw, 6" cap., M.D.
NAZEL #48 Pneumatic Hammer, M.D.
PRATT & WHITNEY (KELLER) Type BL-2416, Type G Copying 3 dimensional, Latest Type

MOREY MACHINERY CO., INC.

406 BROOME ST., NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-5360
CABLE ADDRESS: WOODWORK, N. Y.

GUARANTEED TOOLS

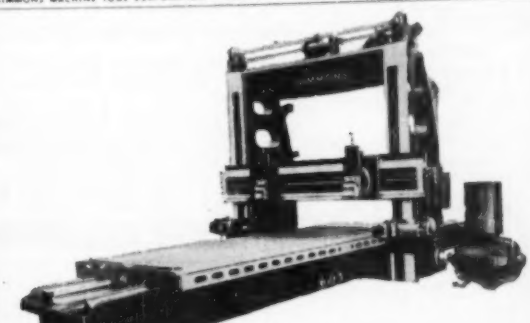
3' AMERICAN Triple Purpose Radial Drill, 9" column, motor on arm, AC—MD
16"x60" PRATT & WHITNEY Toolroom Lathe
20"/40"x14' RAHN LARMON Geared Head Sliding Bed Gap Lathe, taper, chuck, etc.
24"x24' LODGE & SHIPLEY Lathe, 18' centers
28"x12' centers BERTRAM Timesaver Lathe, rapid traverse, 25 HP motor, 1942
30"x12' centers NILES Timesaver Lathe, rapid traverse, 1942
7D JONES & LAMSON Flat Turret Lathe, pre-selector head, 1942
Model R-14 SENECA FALLS "Lo-Swing" Lathe, 16"x40", automatic timing, 1941
6A POTTER & JOHNSON Automatic Chucker
4" bar FOOT BURT Table Type Horizontal Boring Mill, 1942
No. 2M CINCINNATI Universal Mill, rectangular overarm, motor in base, dividing head
No. 3V REED PRENTICE Vertical Mill
No. 31 LUCAS "Precision" Table Type Horizontal Boring Mill, 3" bar
84" CONSOLIDATED COLBURN Vertical Boring Mill, 2 swivel heads, rapid traverse, AC—MD
No. 5 GALLMEYER & LIVINGSTON 12"x36" Surface Grinder
5"x40" Type C LANDIS Semi-Automatic Hydraulic Camshaft Grinder
6"x18" NORTON Type C Plain Cylindrical Grinder, 1943
No. 9G SELLERS Drill Grinder, MD
No. 2 NORTON Tool & Cutter Grinder, 1943
72A3 HEALD Internal Grinder, 1943
27"x36" AMERICAN Wheelabrator Tumblast Machine, 1945
No. 7 FELLOWS Gear Shaper, 1943
1½"—6" JARECKI Pipe Machine, 1943
Model 60 NEW BRITAIN Automatic Screw Machine, 1" capacity
No. 710D NIAGARA Double Crank Press
75 ton HENRY & WRIGHT Dieing Machine, with roll feed, 3½" stroke
No. ½ BUFFALO Universal Ironworker, with coper & notcher
84"x72"x32" NILES BEMENT POND Planer, 4 heads, DC reversing motor drive

O'CONNELL MACHINERY CO.
ISO NIAGARA ST. BUFFALO

SIMMONS NEWS

ENGINEERED Machine Tool REBUILDING

SIMMONS MACHINE TOOL CORPORATION • MAIN OFFICE AND PLANT 1700 N. BROADWAY, ALBANY, N. Y.



136" x 96" x 30' Simmons Heavy Duty Planer, four heads, Power rapid traverse, Forced feed lubrication, Herringbone gear train, Cutting speeds 19 to 115 FPM, 230 volt D.C. Planer Type Reversing Motor and Pendant Control Station. Inspect at Albany.

NEW YORK OFFICE—50 EAST 42ND STREET
PHILADELPHIA REPRESENTATIVE—PHONE—VICTOR 8-3133
PITTSBURGH REPRESENTATIVE—PHONE—PENHURST 1-3700

PRECISION BORERS

Two No. 2112 Excello single end, 2 spindle
One No. 112C Excello single end
Two No. 218 Excello heavy, double end
One No. 42 Heald heavy 2 spindle, work rotating type

HORIZONTAL BORING MILLS

3" bar Universal, No. 3A
3¼" bar Lucas, No. 32
4" Niles Bement Pond floor type
4½" bar Lucas, No. 33
5" bar Jones planer table type

VERTICAL BORING MILLS

24" Bullard vertical turret lathe
38"-44" Niles vertical turret lathe
52" King
84" Gisholt
100" Niles Bement Pond extra heavy

GEAR HOBBERS

No. 12 & type T Barber Colman
No. 8H, 12H, 16HS & 18H Gould & Eberhardt
No. 130 Cleveland Rigidhobber
Nos. 1 & 5A Lees Bradner
No. 7125A Fellows gear shaper

GRINDERS, CYLINDRICAL

6"x18", 10"x18", 10"x36" & 14"x36" Landis hydraulic
10"x20", No. 1 Brown & Sharpe universal
6"x18" No. 10 & 6"x32", No. 11 B & S mechanical
10"x24" & 16"x72" Landis mechanical
10"x36" Norton hydraulic semi-automatic
10"x18", 10"x30" & 10"x50" Norton mechanical
12"x36" Cincinnati Filmatic universal

GRINDERS, SURFACE

Nos. 10, 16 & 16A2 Blanchard rotary
12" & 16", No. 22 Heald rotary
16" & 24", No. 25A Heald rotary
8" Pratt & Whitney rotary (Tub)
8"x24", No. 34 Abrasive vertical
14"x36" Pratt & Whitney vertical
8"x24", No. 78 Wilmarth & Morman
8"x22", No. 3 Abrasive

GRINDERS, TOOL & CUTTER

K.O. Lee universal
Oliver template tool bit
Nos. 1 & 4T Sellers
Gisholt for lathe & planer tools
No. R6 Keller radius tool
No. 47 Excello carbide tool
18" Whitney wet tool
No. 13 Brown & Sharpe univ.
30" Ingersoll face mill

ENGINE LATHES

14"x6', 18"x6' & 20"x8' Lodge & Shipley
16"x5' & 16"x6' Sebastian
16"x10' American
18"x8' Rockford
25"x48" centers Leblond
26"x120" centers Wickes
30"x16' Leblond
36"x108" centers Bridgeford
40"x80" centers Leblond

MILLERS, KNEE TYPE

Nos. 2AS & 3B Milwaukee plain
No. 3 Van Norman duplex
No. 3 Oesterlein
No. 3 Cincinnati vertical
No. 3H Kearney & Trecker vertical
No. 3 Cincinnati HSDT vertical
No. 3 Kempsmith Maximiller vertical
No. 4 Cincinnati High Power vertical
Nos. 1-12 & 1-18 Cincinnati production

SHAPERS & PLANERS

16", 20", 24" & 28" G. & E. shapers
20" & 24" Gemco univ. shapers
24" Columbia univ. shaper
16" Bement Miles slotter
30"x24"x6' Liberty openside planer
36"x36"x8' Gray planer
48"x48"x12' Cleveland openside planer

MILES MACHINERY CO.
Box 770 SAGINAW, MICH.

LATE MODEL TOOLS

18"x30" LODGE & SHIPLEY Selective Geared Head Engine Lathe.

NEW 250 Ton BLISS Knuckle Joint Press. M.D.

4½"x36" P&W Model C Thread Miller

No. 2H5 CINCINNATI Vertical High Speed Dial Type Miller.

Nos. 2K and 3H K&T Vertical Millers.

No. 2BL NATCO "Holesteel" Multiple Spindle Drill, rectangular head.

No. ½B P&W Two Spindle Reaming Machine.

No. 2 B&O Grand Electric Turret Lathe.

No. 3 W & S Ram Type Univ. Turret Lathes.

FOR SALE
LATE TYPE INGERSOLL
36" x 36" x 12'
PLANER MILLER
Adjustable rail, three heads, 40 HP AC Motor Drive. Excellent condition.
IMMEDIATE DELIVERY

Model W-7 BAUSH Hydraulic Multiple Spindle Drills.

20" G&E Industrial Shaper.

No. 3B B&S Dual Control Plain Miller.

No. 145 CLEVELAND Rigid Hobber.

No. 12 FELLOWS Gear Shaver.

Nos. 1LMS and 2LMS Leland-Gifford 4 and 6 Spindle Drills, 1942.

Wigglesworth MACHINERY Co.
MACHINE TOOLS
203 BENT ST.
CAMBRIDGE 41
MASS.
KIRKLAND 7-5242

MODERN MACHINES

#35 Landis Horizontal Boring Mill, 3½"
5'13" Cincinnati Bickford Radial Drill
24"x10' centers American Lathe
24" Potter & Johnson Shaper
#35 Excello Thread Grinder
612A Fellows Gear Shaper
28.120 Cincinnati Horizontal Hydrotel
36.90 Cincinnati Hydromatic Miller

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St. Providence, R. I.

60% DISCOUNT
PLATE MOUNTED TOOL & CUTTER GRINDING WHEELS

One size: 10" x 2" x 5"
Three grits: 60-100-120
One price: $10.00

New, guaranteed. Mfd. by Norton, Carborundum. Additional discount on quantity orders. Immediate delivery. Order from—

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1527 E. Seventh Street
Los Angeles 21, California

#1H LIBBY TURRET LATHE

8 Spindle speeds. 6¼" hole in spindle. 18" 3- and 4-jaw steel body chucks, swing over ways 24", quick change gear, taper attachment. Large assortment of turret tools. Condition like new.

F. H. ROBERTSON COMPANY, Inc.
420 Broadway, Malden 48, Mass.

POWER SQUARING SHEAR

CINCINNATI ALL STEEL SHEAR, Model #10008, 8'-1" capacity, with front and rear gauges, hold down, electrical equipment, extra set of blades, weight 66,000#. Can be inspected in operation—in excellent mechanical condition. LATE MACHINE.

HASCO MACHINERY COMPANY
661 Frelinghuysen Ave., Newark 5, N. J.

FOR SALE

SQUARE D, 20 Station
Master A. C. Controller
with Pedestal Unit

H. L. BOGGESS Liberty, Mo.

MACHINERY FOR SALE
ATTENTION EXPORTERS!

Unusual opportunity to procure modern Fellows Gear Shapers 615A and 645 as well as 12" Gleason Generators, 38 BM Gould & Eberhardt Rougher, #7 Fellows Gear Shaper, #16 D. E. Whiton Machine. Write for full information.

FB-1655, AMERICAN MACHINIST
330 W. 42 St., N. Y. 18, N. Y.

LARGE LATHE — BARGAIN

QUICK CHANGE GEARED HEAD LATHE, HOUSTON-STANWOOD-GAMBLE, 42" SWING, (WILL SWING 50" WITH RISERS NOW ON MACHINE), x 30' CENTERS. AC MOTOR DRIVE.

VERY GOOD CONDITION

WINSTON MACHINERY COMPANY, INC.
517 S. Delaware St., Indianapolis 4, Indiana

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED
MEDART
JOSEPH HYMAN & SONS
Tioga, Lexington and Almond Streets
Philadelphia, Pa.

LATEST TYPES — GUARANTEED MACHINE TOOLS 1941-1950 MODELS

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables.
CINCINNATI: #2M Vertical, Rotary table, P.F.
CINCINNATI: 6-8 Vertical
SUNDSTRAND: 96 Rigidmil—Duplex (for milling cam tracks in propeller hubs or similar work)
SUNDSTRAND: #00 Rigidmil—Hydraulic
SUNDSTRAND: #0 Rigidmil
MOREY: 12M 2-spindle Profiler
TAYLOR-FENN: M-00 Duplex Spline
TAYLOR-FENN: Vertical 6"x21" Table, power feed
VAN NORMAN: 10CT Contour Miller

THREAD MILLERS & TAPPERS

MOREY: 12"x60" Thread Miller
LEES BRADNER: 40A Thread Miller
LEES BRADNER: LT 6x36" Thread Miller
HALL PLANETARY: B, C & D Thread Millers
MURCHEY: #22 Tapper, Horizontal
PRODUCTO: Hand Tapper
NATCO: Vertical Tapper 16 spindle

TOOL SHARPENERS

OLIVER: 2A Face Mill Grinder
OLIVER: 510 Drill Sharpener
OLIVER: 10" Tool Bit Grinder Template Type
FELLOWS: Flat Top Helical Gear Cutter
RANSOM: 2-wheel grinder 3 HP

GRINDERS—THREAD

EXCELLO: #31 & #33 External
JONES & LAMSON: TG040 External
JONES & LAMSON: TG1245 External

GRINDERS—CYLINDRICAL

NORTON: 6"x18", & 10"x18", Plain
NORTON: 10"x18" 45° angle wheel head
NORTON: 12"x36" Universal
LANDIS: 18"x18" "C" Plain Hydraulic
LANDIS: 18"x32" Type "D" Crankpin, Hydraulic
CINCINNATI: #2 Centerless
CINCINNATI: 8"x18" Hydraulic Fitmatic
BROWN & SHARPE: #10 & #23 Plain

GRINDERS—INTERNAL

BRYANT: #5 and #5Y Internal
BRYANT: 10C16 Internal
HEALD: #35 Planetary
HEALD: 70A Plain Internal
HEALD: 72AS T-bed, Universal
HEALD: 72AA, 72A5 Plain & Universal
HEALD: 72A3 Sizematic Contorlom
HEALD: 72A5 Sizematic
HEALD: 172 Sizematic for Cylindrical Cams
BRYANT: 412 Universal, Hydraulic
BRYANT: 10-28 Hole Grinder
RIVETT: #104 Tool Room Universal

GRINDERS—RADIUS

VAN NORMAN: #72, 630, 640 Oscillating
VAN NORMAN: #3½ Universal

GRINDERS—SURFACE

THOMPSON: 8"x12"x18" Type B
THOMPSON: 12"x18"x36" Type C
HEALD: Rotary 8" dia. chuck
HEALD: #22 Rotary—12" Chuck
GARDNER: 120A Opposed Head Disc

HONING & LAPPING

BARNES: 306 H Vertical Honing
MICROFATIC: H-510 Double End Horizontal
MICROMATIC: H-2 Single End Horizontal
NORTON: #26C and 28F Hyprolaps
NORTON: #2Fx40" Diameter Lapper
SCHRANER: External Cylindrical Lapper with six Heads Model A

GEAR & SPLINE GRINDERS

PRATT & WHITNEY: 10" single & double wheel
GEAR GRIND MACH: GG-10 (10"x24"). Hydraulic Spur Gears & Splines also internal
GLEASON: #17 Spiral, Zerol & Hypoid Bevel
MAAG: 8830 11⅝" diameter

GEAR CUTTING MACHINES

BARBER-COLMAN: #3 Hobber
BROWN & SHARPE: #6 Cutter—72" diameter
CLEVELAND: #140 Hobber—1 spindle
FELLOWS: 6Z2 Shaper
FELLOWS: 6I, 6IA, 6AA, 7 & 72 Gear Shapers
FELLOWS: Straight Line Generator
GLEASON: 3" Straight Bevel Gear Generator
GOULD & EBERHARDT: 12H Hobber, 18" dia.
GOULD & EBERHARDT: 36BM Cutter
HAMILTON: #1 Hobber 6" diameter
SYKES: Gear Machinery (all sizes)

GEAR FINISHERS & TESTERS

FELLOWS: 8L5I & 13L5I Gear Lappers, External & Internal, Spur & Helical
FELLOWS: #12 C Spacing Tester
GLEASON: #13 Universal Gear Tester
GLEASON: #4 & #6 Bevel Gear Testers, Hand & Power Operated
GLEASON: 3" Bevel Gear Tester
ILLINOIS: 514 Caster distance & concentricity checker
ILLINOIS: 604 Bevel Gear Hand Rolling Fixture
ILLINOIS: #224 Involute Checker and Recorder
RED RING: RIC-12" Gear Tester
FELLOWS: #8M Rod Liner

PRECISION BORING

BARNES: #412 Horizontal 60" Travel
HEALD: 48A Single End 2-spindle
HEALD: 47A Single End 2-spindle
HEALD: 46B Double End Borematic

LATHES—PRODUCTION

POTTER & JOHNSTON: #4D Automatic
SUNDSTRAND: 8x15 Auto. Lathes
LODGE & SHIPLEY: #3A Duomatic
LIPE-ROLLWAY: 6"x30" Carbomatic
LEBLOND: 25"x48" Engine Lathe, raised to 40"

LATHES—TURRET

BULLARD: 24", 38" Vert. Spiral Drive
WEBSTER & BENNETT: Vertical Turret Lathes 36", 48" and 60" sizes
GISHOLT: No. 4 Ram Type
GISHOLT: 2L Saddle Type, Extended Bed
HERBERT: Turret Lathes (all sizes)

DRILLING MACHINES

AVEY: #2 Deep Hole Hydraulic
LELAND-GIFFORD: #2LMS Deep Hole Vertical
BARNES: 201½ 2 spindle on 4 spindle base
BAKER: 30HO 2 spindle inverted 4" dia. cap.
BAKER: 217 Upright Heavy Duty 2" dia. cap.
FOSDICK: #48M Upright High Speed
PROVIDENCE ENG: 6-spindle ⅝" capacity
PRATT & WHITNEY: ½Bx50 Deep Hole Reamer
ARCHDALE: Radial, all sizes (New)

MISCELLANEOUS

CINCINNATI: 2-36 Broaching Machine
BLOUNT: Polishing Lathes 12x48
GARDNER: #6 Disc Grinder—20" 10 HP
ALLEN: #2 Stud Setter
CAMPBELL: #42S Abrasive Cutolator
WILLIAMS: 10" Pipe Cut-Off
TANNEWITZ: GH-36 Band Saw High Speed
KENT: 3½" Bar Pointer and Chamfer
MATTHEWS: 79A Marking Machine
GENERAL: #33 Flexible Press
DENISON: 9B-AM Hydr. Tool Stand
OSBORN: 602 Jolt Rollover for Foundry
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Lodge & Shipley #3 Duomatic Lathes
Monarch 20"x48" Engine Lathe, Latest
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Hendey 24"x72" B.C. Lathe, Latest
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American 18"x8' Geared Head, Quick change
American 18"x10' Geared Head, 8 speed
American 24"x8' Geared Head, 8 speed
American 24"x10' Geared Head
American 24"x12' Geared Head, 12 speed
American 24"x14' Geared Head, 8 speed
American 30"x13' Geared Head, 12 speed
Boye & Emmes 18"x6', 3 SCD, DBG
Boye & Emmes 18"x8', 3 SCD, DWA
Boye & Emmes 20"x8', 3 SCD, DBG
Hendy 14"x8', 3 SCD
Hendy 18"x6', 4 SCD, SBG
Hendy 18"x8', 4 SCD
LeBlond 14"x8', 4 SCD, SBG, Drive all Drive
LeBlond 21"x8', 3 SCD, DBG
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Lodge & Shipley 14"x5', 5 SCD, BG
Lodge & Shipley 14"x6', 3 SCD, DBG
Lodge & Shipley 16"x30" centers, GH, New 1942, FIRST CLASS
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Lodge & Shipley 18"x8', Geared Head, FIRST CLASS
Lodge & Shipley 18"x8', 5 SCD, SBG
Lodge & Shipley, 18"x8', 3 SCD, DBG
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No. 2418 Keller, Hyd., 3 spin., Late
18-36 K. & T. Simplex Miller, 1942
36-90 Cinci. Duplex Hydro. Miller, '42
No. 3 Cinci. Dial Vert. Miller, Late
No. 2M Cinci. Vert. Miller, 1942
No. 2LU Van Norman Univ. Miller, '42
2½" bar #25T G. & L. Table Hor. Bor. Mill
8'17" col. Carlton Radial, new 1943
5'10" col. Amer. Tri. Purp. Radial, AC, M.D.
Barnes Combo. Boring & Honing Mach. up to 10' bore x 8' hole, 1942
12"x30" cen. Pratt Whitney Model B La., '43
14"/10¾"x30" cen. L. & S. Lathe, T.A., '43
14/10½"x54" cen. Bradford La, T.A., '43
42"x26'8" cen. Simmons Lathe, 1942
48"x28' cen. Amer. La., 2 serv., 2 T.A.
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INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives, Coated 18-19, 130

Accessories & Attachments (Machine Tool) 10-11, 48, 185, 187

Balancing Machines 56

Bearings ..... 4th Cover, 126, 159, 187

Boring, Drilling & Milling Machines (Horizontal) 14-15, 49

Boring Machines Internal ..... 2nd Cover

Boring & Turning Machines (Vertical) 14-15, 57

Broaching Machines 28, 81

Centrifugal Machines 54, 187

Chucks 43

Collets 43, 67

Controls, Electrical 8-9

Counters 17

Cut-Off Machines; Sawing Machines 50, 189, 190

Die Making Machines 160

Dressers, Grinding Wheel 123

Drilling Machines 29, 60, 63, 82, 143, 184, 188

Fabricating Methods & Services 187

Fasteners 41, 46, 145, 166, 173, 174

Gages & Instruments 26, 33, 34, 38-39, 52, 74, 123, 153, 186, 188, 189, 190

Gear Cutting Machines 3, 6-7, 64, 171, 176

Gears, Speed Reducers, Motor Reducers 165, 182, 183, 185

Gear Testers 3, 6-7, 171

Grinders—Cutter & Tool 4-5, 160, 172, 181, 186

Grinding Machines—Production ..... 2nd Cover, 4-5, 12-13, 22, 59, 62, 65, 181

Grinding Wheels 18-19, 130

Heat Treating Equipment & Supplies 190

Honing Machines 72

Hydraulic & Pneumatic Parts & Equipment 27

Jig Borers 190

Lathes, Automatic 23, 26, 44, 155

Lathes, Engine 40, 44, 53, 55, 58, 151, 164

Lathes, Turret 23, 26, 50

Lubricants, Cutting Fluids, Quenching Oils & Solvents 128, 178, 189

Machines, Super Finishing 42

Marking Machines & Tools 189, 190

Materials, Cutting & Forming 76-77

Materials of Manufacture 24-25, 32, 35, 124, 159, 169, 170

Materials Handling Equipment 78

Mechanical Parts & Equipment 43, 185, 187

Millers, Die Sinkers, Profilers 4-5, 20-21, 167

Motors, Electrical 8-9

Oil Purifiers 54

Planers 14-15, 180

Power Transmission 16, 47, 68, 149, 165, 186

Presses, Forging & Forming Equipment & Supplies 84, 157, 161, 173, 175, 177, 179, 187, 188, 191

Pumps, Circulating 186, 191

Riveting Machines 191

Saw Blades 189, 190

Screw Machines; Chucking Machines ..... 3rd Cover, 51, 58, 61, 162

Shapers, Slotters, Keyseaters 84, 190

Shop Furniture 46

Springs 174

Stampings 174, 190, 191

Tapping Machines 82

Thread Cutting Machines 10-11, 66

Tools, Cutting 10-11, 28, 30-31, 33, 34, 36-37, 43, 45, 48, 70, 76-77, 81, 163, 172, 185, 190

Tools, Measuring 38-39

Tools, Portable 168

Turret Attachments, Lathe 50

Used & Surplus Equipment 193-203

Vises 48

ADVERTISERS INDEX

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

	Page
Abrasive Machine Tool Co.	181
Acromark Co.	190
Allegheny Ludlum Steel Corp.	169
Allied Products Corp.	173
Aluminum Co. of America	35
American Broach & Machine Co.	28
American Screw Co.	145
American Tool Works	29
Ames Co., B. C.	190
Armco Steel Corp.	124
Armstrong-Blum Mfg. Co.	189
Armstrong Bros. Tool Co.	48
Atlantic Gear Works Inc.	182
Barber-Colman Co.	45
Bardons & Oliver Inc.	50
Barrett Co., Leon J.	187
Bellows Co.	185
Bilgram Gear & Machine Co.	182
Blanchard Machine Co.	62
Blum & Co. Inc., Julius	191
Brown & Sharpe Mfg. Co.	38-39
Bryant Machinery & Engineering Co.	55
Buckeye Tools Corp.	168
Bullard Co.	57
Bunting Brass & Bronze Co.	159
Carboloy Co.	76-77
Carlton Machine Tool Co.	188
Carnegie Illinois Steel Corp.	24-25
Cincinnati-Bickford Tool Co.	63
Cincinnati Gear Co.	182
Cincinnati Lathe & Tool Co.	40
Cincinnati Milling Machine Co.	4-5
Cincinnati Shaper Co.	84
Cleveland Punch & Shear Works Co.	179
Cleveland Tramrail Div., Cleveland Crane & Engineering Co.	78
Columbia Steel Co.	24-25
Columbus Die Tool & Machine Co.	187
Cone Automatic Machine Co.	61
Consolidated Machine Tool Corp.	43
Cross Co.	64
Crucible Steel Co. of America	32
Curtis Universal Joint Co.	165
Davis & Thompson Co.	184
Davis Keyseater Co.	190
Dayton Rogers Mfg. Co.	190
Dearborn Gage Co.	153
DeLaval Separator Co.	54
Detroit Broach Co.	81
Eastern Machine Screw Corp.	190
Ex-Cell-O Corporation	70
Fellows Gear Shaper Co.	6-7
Ferracute Machine Co.	175
Fosdick Machine Tool Co.	60
Gallmeyer & Livingston Co.	186
Ganschow Gear Co.	182
Garrett Co., Geo. K.	174
Gates Rubber Co.	149
General Electric Apparatus Dept.	8-9
Geometric Tool Co.	34
Giddings & Lewis Machine Tool Co.	14-15
Gisholt Machine Co.	42, 56
Gleason Works	3
Globe Gear Co.	182
Gorham Tool Co.	185
Goss & de Leeuw Machine Co.	162
Grant Gear Works	165
Grant Mfg. & Machine Co.	191
Gray Co., G. A.	180
Gray & Prior Machine Co.	186
Greenfield Tap & Die Corp.	33
Greer Stop Nut Co.	41
Grob Brothers	190
Hamilton Tool Co.	176
Hanson-Whitney Co.	163
Hardinge Brothers, Inc.	67
Heald Machine Co.	2nd Cover
Hebert Equipment Co.	182
Hones, Inc., Charles A.	190
Kearney & Trecker Corp.	20-21
Kemsol Products Co.	189
Kent-Owens Machine Co.	167
Laminated Shim Co., Inc. (Shim Div.)	166
Landis Machine Co.	10-11
Landis Tool Co.	12-13
LeBlond Machine Tool Co., R. K.	53
Lee Co., K. O.	172
Lees-Bradner Co.	66
Leland-Gifford Co.	143
Link-Belt Co.	16, 47
Linley Brothers Co.	190
Lodge & Shipley Co.	44

ADVERTISERS INDEX

	Page
Lucas Machine Division, New Britain Machine Co.	49
Luers, J. Milton	190
McGill Mfg. Co.	187
Meisel Press Mfg. Co.	182
Micromatic Hone Corp.	72
Modern Tool Works	43
Monarch Machine Tool Co.	58
Morris Machine Tool Co.	82
Morse Twist Drill & Machine Co.	36-37
National Acme Co.	51
National Broach & Machine Co.	171
National Machine Tool Co.	172
National Machinery Co.	157
National Twist Drill & Tool Co.	31
New Britain Gridley Machine Co.	3rd Cover
New Hermes Inc.	189
Norton Co.	18-19, 26
Oliver Instrument Co.	160
Philadelphia Gear Works	183
Pioneer Pump & Mfg. Co.	191
Potter & Johnston Co. Sub. Pratt & Whitney Div. Niles-Bement-Pond Co.	23
Pratt & Whitney Div. Niles-Bement Pond Co.	22
Quaker City Gear Works	185
Reeves Pulley Co.	63
Rivett Lathe & Grinder Inc.	65
Rodgers Hydraulic Inc.	161
Ruthman Machinery Co.	186
Ryerson & Sons Inc., Joseph T.	170
Scherr Co. Inc., George	186
Schnell Tool & Die Corp.	191
Schrader's Son, A.	27
Seneca Falls Machine Co.	155
Sheffield Corp.	123
Shore Instrument & Mfg. Co. Inc.	188
Sidney Machine Tool Co.	151
Simonds Abrasive Co.	130
Springfield Machine Tool Co.	55
Standard Pressed Steel Co.	46
Strong, Carlisle & Hammond Co.	173
Stuart Oil Co., D. A.	178
Sun Oil Co.	128
Tennessee Coal, Iron & Railroad Co.	24-25
Thompson Grinder Co.	59
Timken Roller Bearing Co.	4th Cover
Torrington Co.	126
United States Steel Corp.	24-25
United States Steel Export Co.	24-25
United States Steel Supply Co.	24-25
V & O Press Co. Div. of Harford-Empire Co.	177
Van Keuren Co.	52
Veeder-Root Inc.	17
Wade Tool Co.	164
Waltham Machine Works	188
Webber Gage Co.	74
Wilson Mechanical Instrument Co.	189
Winter Brothers Co.	30
Zeh & Hahnemann Co.	188

SEARCHLIGHT SECTION
(Classified Advertising)

EMPLOYMENT	Page
Positions Vacant	192
Selling Opportunity Wanted	192
Employment Services	192
SPECIAL SERVICES	
Contract Work	192
General Pattern Works	192
BUSINESS OPPORTUNITIES	
Offered	192
EQUIPMENT	
(Used or Surplus New)	
For Sale	193-203
WANTED	
Equipment	202

ADVERTISERS INDEX

Aaron Machinery Co.	197
Beaver Industries	195
Bennett Machinery Co.	203
Boggess, H. L.	200
Botwinik Bros. of Mass., Inc.	202
Brownell Machine Tools, Inc., Hazard	200
Cincinnati Machinery Co., Inc.	203
Cook, Joseph M. & Staff	192
Cox Machinery Co., Inc.	198
Dony Machinery Co., D. E.	202
Eastern Machinery Co.	196
Emerman Machinery Corp.	194
EPCO	200
Fairfield Equipment Co.	202
Falk Machinery Co.	193
Goldman & Co., Harvey	198
Hasco Machinery Co.	200
Hill-Clarke Machinery Co.	194
Hughes Aircraft Co.	192
Hyman & Son, Joseph	200
Indianapolis Machinery & Supply Co.	196
J & L Machinery & Suply Co.	201
Judge & Co., Inc., Frank M.	197
Kings County Machinery Exchange	198
Lake Machinery Co.	201
Land, L. J.	202
Midwest Air Control	202
Miles Machinery Co.	200
Morey Machinery Co.	199
National Machinery Exchange	202
Noll Equipment Co.	203
O'Brien Machinery Co., The	203
O'Connell Machinery Co.	199, 202
Osborne & Sexton Machinery Co.	194
Paul's Machinery Co.	201
Robertson Co., Inc., F. H.	200
Rosenkrantz, Weisbecker Co.	202
Sheffield Trading Co., Inc.	192
Simmons Machine Tool Co.	199
Triplex Machine Tool Corp.	201
Tri-State Products Co.	196
Wabash Employment Agency	192
West Penn Machinery Co., Inc.	201
Westinghouse Electric Corp.	192
Wigglesworth Machinery Co., Inc.	200
Winston Machinery Co., Inc.	200, 201, 202

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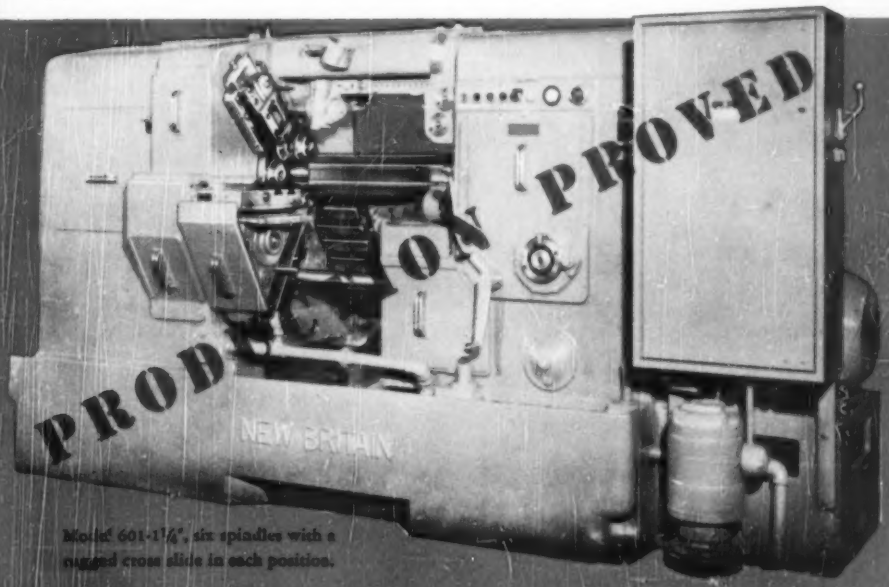

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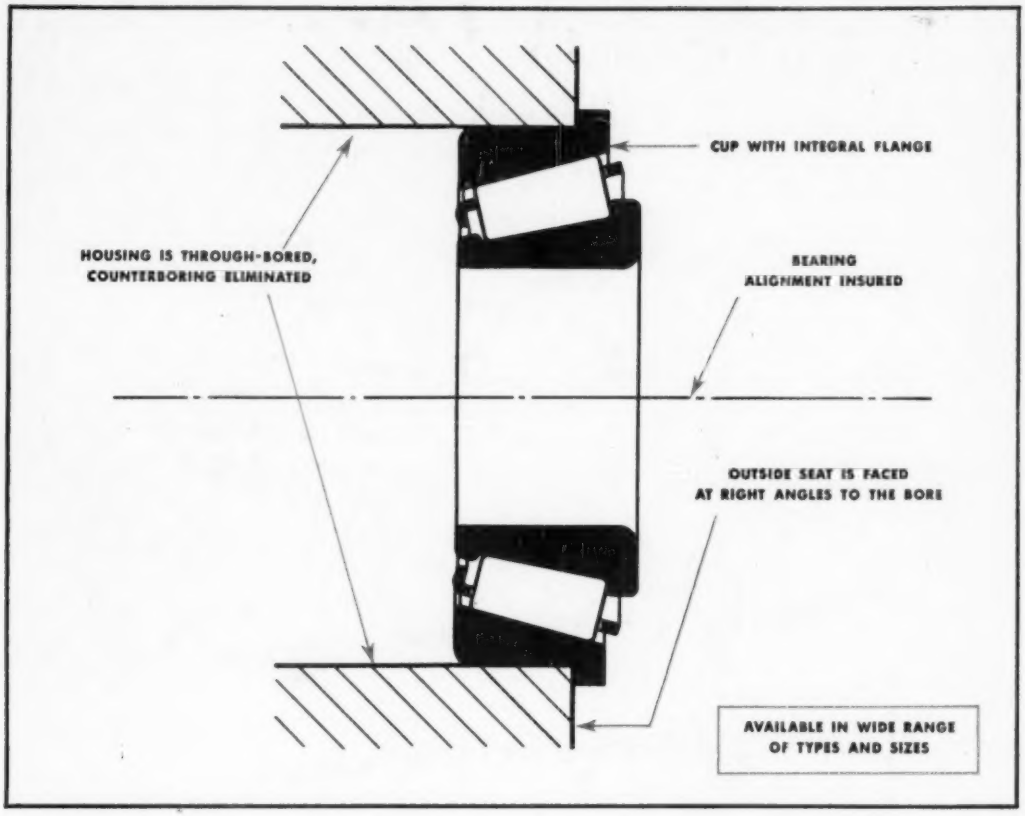
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